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Electrical West

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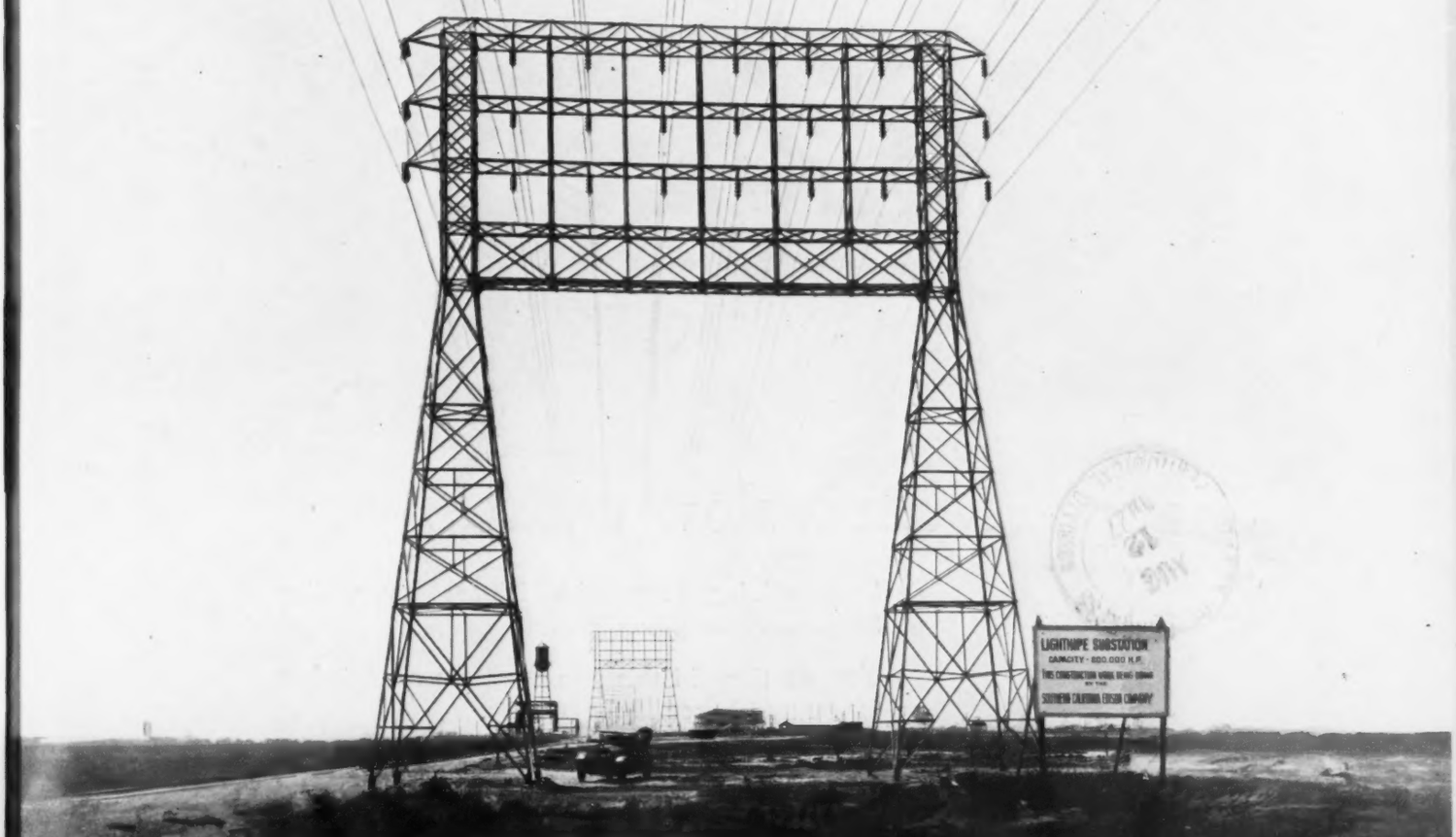

8-Circuit, 60-kv. Pacific Coast Steel Company tower line structures on Laguna Bell-Lighthipe-Long Beach line of the Southern California Edison Company. The double set of similar structures in the background extends in a southerly direction from Lighthipe Substation.

PACIFIC COAST STEEL COMPANY

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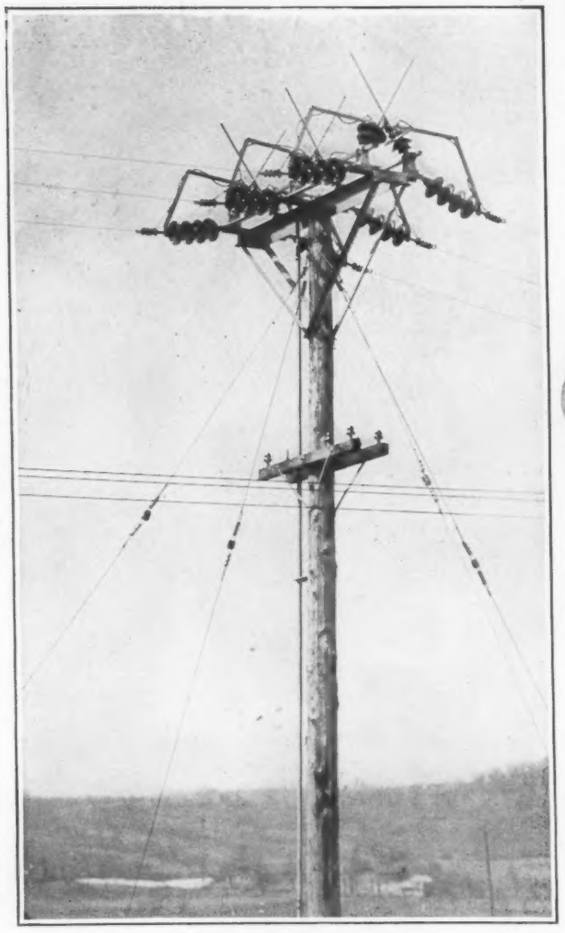

Snapped from a slow train in N. Y.

Sectionalizing lines with Elpeco Horn Gap Switches seems pretty general.

You see them in this role from the car window as you travel around the country.

Of course it is the *reliable* means—and I snapped this one because it shows an economical installation—on a single pole.

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When you get economy and reliability in any single piece of equipment—what more can be asked?

L. P. Cox

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E. K. JONES, *News Editor*
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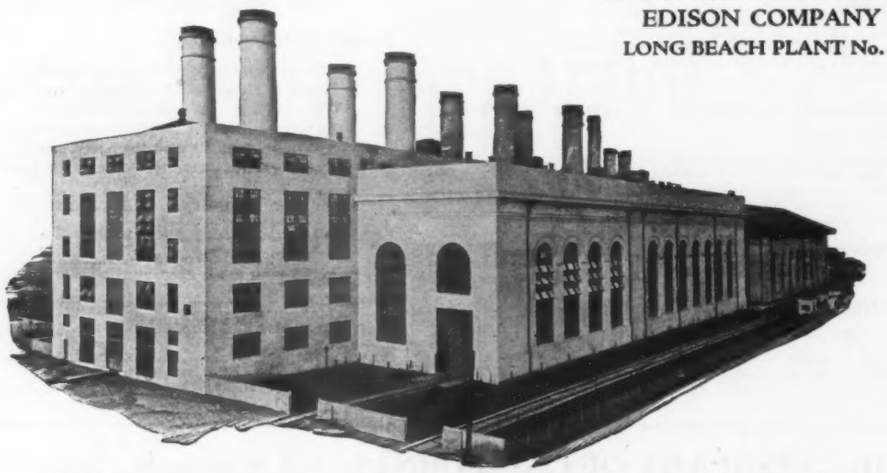

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Dividends and Taxes in a New Light

AN ORDINARY balance sheet or statement of earnings such as is contained in any annual report of one of our power companies has little in it to excite the interest of the average layman, unless he be sufficiently trained in finance to understand it adequately. D. C. Green, president of the Northwest Electric Light and Power Association, in his annual report at Salt Lake City, however, advanced a suggestion that, applied to such reports, might make them of intense interest to every utility customer.

In speaking of his own central station, the Utah Power & Light Company, Mr. Green pointed out that annual dividends on preferred stock paid to stockholders residing in the territory served by the company aggregated $876,000, or an average of $11.60 per residential customer served. He further stated that the company paid $1,000,028 annually in city, county and state taxes. This is an average of $13.25 per residential customer. The sum of these two items, $24.85, is greater than the average annual lighting bill of any residential customer in the territory.

The significance of these figures cannot help but be appreciated by every domestic consumer for they materially affect his pocket book. He is familiar with both taxes and dividends. Mr. Green's interpretation of these figures has much to commend it for further use by other companies.

Back Door Public Relations

DIPLOMACY in Europe has been developed to the point of becoming an art. It is something of a tradition and it influences political procedure not a little. So inculcated has become the old school diplomacy of Europe that even the simplest of procedures must be conducted according to those traditions. Nothing must be accomplished, in the tradition of many nations, unless the devious path is chosen for it. The straightforward presentation would not be understood. It is not traditional.

Some of the public relations activities of many companies seem to be burdened with this same European tradition. If there is any possible devious way by which an object may be sought, that seems to be the preferred path. Often the soft slippered "public relations" representative may be seen sleuth-footing through an alley, up a fire escape, down a rain spout and in through the pantry ventilator, thence to proceed with caution to the kitchen, thence, disguised as a viand or a cordial, to be served before a dignitary at last with his message. Meanwhile the front doorbell has been in good working order and these "Skewby X. Blump" tactics perhaps entirely unnecessary.

Public relations should be simple enough. The art of getting along with neighbors is not a furtive, involved proceeding. Neither is it a patronizing gesture. After all it is a simple, straightforward undertaking, involving, if you please, the "selling" of that neighbor on his own personal interest in mutual friendship and understanding.

Diplomacy in Europe is retarding frankness and understanding in international relationships. The same kind of diplomacy in industrial public relations is not apt to be any more successful than it is in Europe, where it is considered beyond the comprehension of ordinary people to allow information to be disseminated generally. A more intelligent public is not accepting such a valuation of its capacity to understand and is suspicious of anything but cold-blooded frankness.

Oregon Courts Find Municipal Utilities Are Subject to Regulation

WHILE numerous efforts to place municipal electric utilities under the jurisdiction of public service commissions have failed in various Western states, it is interesting to note that the Oregon courts, as reported on another page of this issue, have decided that as soon as such municipal undertakings extend operations outside their corporate limits they become public utilities in the fullest sense of the word and as such are subject to the laws governing other utilities.

The case in question arose over an appeal of the Yamhill Electric Company to the Oregon Public Service Commission to restrain the City of McMinnville from entering territory already served by the Yamhill company. The Public Service Commission declined to act in the matter until the courts interpreted the law. The court in granting an injunction interpreted the law to mean that so long as a municipal utility confined its activities within its corporate boundaries it was free to proceed as it desired; on the other hand, if it extended its lines outside its boundaries, it entered into competition with existing privately owned utilities and thus was subject to Public Service Commission jurisdiction.

This distinction possibly may have considerable bearing on the future operations of a number of municipal utilities in Pacific Coast cities. Particularly in Washington, where Seattle and Tacoma have extensive transmission facilities, might the precedent established by the McMinnville case apply. The industry must continue to look to the courts for interpretations of this character until such a time as the voters in the various states favor amendments that will place municipal power enterprises in the same category as privately owned utilities in so far as regulation is concerned.

Petting Parties for Officials Not Altogether in Good Taste

EVEN in an age in which open and aboveboard petting goes on before one's very eyes the practice has not yet attained to the dignity of simple good taste. While there may be a little doubt as to the favor with which it is looked upon by the participants thereof, the same cannot be said of those who perforce are made to witness it. To be placed in a position which forces a non-participant into prolonged visual or aural contact with someone else's love feast not only conduces to ennui but brings about an embarrassment which reflects no credit upon those who indulge in the practice.

When petting is translated into business, somewhat modified as to form, it is true, the practice cannot be said to be in much better taste. The luncheon club speaker representing an industry or a company, who gushes sweet nothings about the hero who guides the destinies of his company, his superb attributes and his blameless, angelic character, may enjoy doing so. His boss, too, may enjoy this public osculation, or he may not. But it is tough upon the poor beholder who has to listen to it all.

There are instances in which laudation of an individual is both becoming and fitting. It is always pleasant to see achievement recognized and worth rewarded by recognition as long as it is not done sentimentally. The audience can take part in giving the honor which is due the deserving individual or organization. But it is hardly good form to have all such laudation come from a subordinate of the "honoree."

When a speaker rises to address a group and spends much of his audience's time in pouring forth honeyed words concerning his chief or his company it is only natural that he who must listen should become uneasy and suspicious. The listener is not to be blamed if he feels that either the speaker or his superior cannot be very sure of himself if he has to reassure himself by this form of self-adulation. He is justified, perhaps in such a surmise.

We Reiterate, Sound Selling Is Sound Public Relations

IF THE past year can be credited with the development of a commerical consciousness on the part of the majority of the light and power companies, then it is to be hoped that during the coming year there will be a definite realization of the truth of the statement that a satisfied and contented customer is the utility's best friend. Many speakers at the various conventions just held commented upon the possibilities for improving public relations that the sale of the electrical idea offers, but few summed up the subject any better than the able chairman of the Commercial National Section, J. E. Davidson, when he said:

"The sale of electrical products to the American public means far more to the industry than can be measured by the profit of the merchandising itself. Nor am I thinking, when I say this, of the fact that the sale of such products will mean a greater consumption of current, leveling of the load curve, and a better return from the capital invested in equipment. What I mean is that the sale of our service and merchandise is the best good-will factor that can be built into the electrical industry. A good product, relieving the householder of burden and making for more economy in the home, will do more toward cultivating good-will for the light and power companies, for the manufacturer, and for the whole industry, than any number of pamphlets and speeches. Here, then, we have the greatest opportunity that the industry ever had, not merely to make dollars but to make friends. * * The time has come when we must concentrate upon the selling of appliances and the selling of the electrical idea, not merely because it is good business but because it is the best public policy that we could adopt."

The soundness of this reasoning is too obvious to require comment. Its truth is already known to many of the men close to the industry's selling job. It should be the task of these men to sell it to their executives since, in the last analysis, they are the ones who determine sales policies.

Executive Interest Necessary for Success of Conventions

A DEPLORABLE condition observed at the two recent conventions at Salt Lake City and Santa Cruz was the conspicuous absence of higher executives of the utilities. It is doubtful whether a color guard made up of men who carried the title of vice-president could have been recruited at either meeting. This apparent lack of executive interest is a severe blow to the effectiveness of the work of these two associations. There was one single exception. In one case the chief executive of a particular utility remained at home so that more of the employees down the line might attend. He let it be known that this was the case, and in return for the privilege of attending the convention he cautioned each delegate to bring back a complete report of his observations. This executive is to be commended.

But what of the remaining cases? There are many reasons why the chief executive should attend these regional conventions if he is able to do so. In the first place, the majority of section and commitee chairmen are department heads from among the various member companies. Why should these men exert themselves to do a good job unless they be accorded the privilege of making their reports in the presence of their superior officers?

Central-station executives frequently use pressure to induce employees to join the association for the benefits that might accrue to the company from the interchange of ideas that association work makes possible. Are the executives so well versed in the affairs of the industry that they themselves may not learn from the reports and papers that comprise the program?

There is nothing in the world more potent than the force of example. It is necessary that executives themselves think enough of association work to grace the conventions with their presence. Otherwise there is little incentive for their employees to devote the attention to convention programs that is necessary if the maximum good is to be achieved. Their presence lends dignity, standing and importance to the convention that could not otherwise be obtained.

We are heartily in favor of the movement to increase the effectiveness of association work in general and of conventions in particular. One of the best ways of doing this is for the executives of the central stations to show a constructive interest in the activities of the associations to the extent of attending the conventions. Their physical presence and moral support will be positive proof that they, too, are aware of the opportunities that association work affords.

Continuity of Program Promises Success to Western Associations

WITH exceptionally fine records for the year just closed the two Western geographic divisions of the National Electric Light Association already are showing that the industry may expect much in the way of accomplishment for the association year 1927-8. The factor that has done most in insuring the continuation of the fine records of past years has been the working out of a plan of continuity of program in the affairs of both the Pacific Coast Electrical Association and the Northwest Electric Light and Power Association. Added to this has been the adoption of organization plans in the Northwest association and in the Commercial Sections of both associations permitting a logical succession in office of the men who head the various group activities.

As a result of these two factors, active work for the coming year had been outlined for all branches of the Pacific Coast Electrical Association before the close of the convention at Santa Cruz. President W. L. Frost held a meeting of his executive committee, and section chairmen reported on preliminary programs for the year. Both the Engineering and Commercial Sections held executive committee meetings, appointed committee chairmen and laid out plans for the year's work.

At the Salt Lake convention the Northwest association amended its constitution to provide for the election of a vice-president at large who will succeed to the office of president. Much lost time and motion thus will be obviated. President A. C. McMicken already has held a meeting of his executive committee and prior to that he had appointed section chairmen. An organization plan for the Northwest Commercial Section similar to that of the P.C.E.A. also received executive approval at Salt Lake City and is now in effect.

Citation of these facts indicates that there is a growing appreciation of the work of the geographic divisions of the N.E.L.A., at least in this territory. Succession in office, the bringing into the work of the association of the most promising of the younger generation of utility men, and the injection of continuity into the programs of the associations promise much for the future of these organizations.

Grasping at Straws Unprofitable Pastime

DROWNING men, is is said, grasp at straws. If the inverse law applies, namely that those who grasp at straws may be said to be drowning, is true, the Los Angeles Bureau of Power and Light is in a bad way. Whether it is in a bad way or not, it may be said not only to grasp at a straw but to do some severe straining in doing so.

Not in the least daunted by the will of the people,—which it so eloquently championed at one time—as expressed by the verdict of those same people at the polls July 7, the bureau has conceived a brilliant idea to confound all and sundry. The bureau prevailed upon the old city council, now no longer in office, to instruct the city attorney to proceed against the Los Angeles Gas and Electric Corporation on a legal technicality which, if not a straw, has little more weight or substance than one.

The clause in the California state constitution which grants a franchise to central-station companies to enter public streets with electrical distribution systems for illumination is the point of attack. It is the contention of these astute and pure rhetoricians of the power bureau that this clause gives to the power company a franchise for "lighting only," and ergo, that distribution of electrical energy by it for heating or power is illegal.

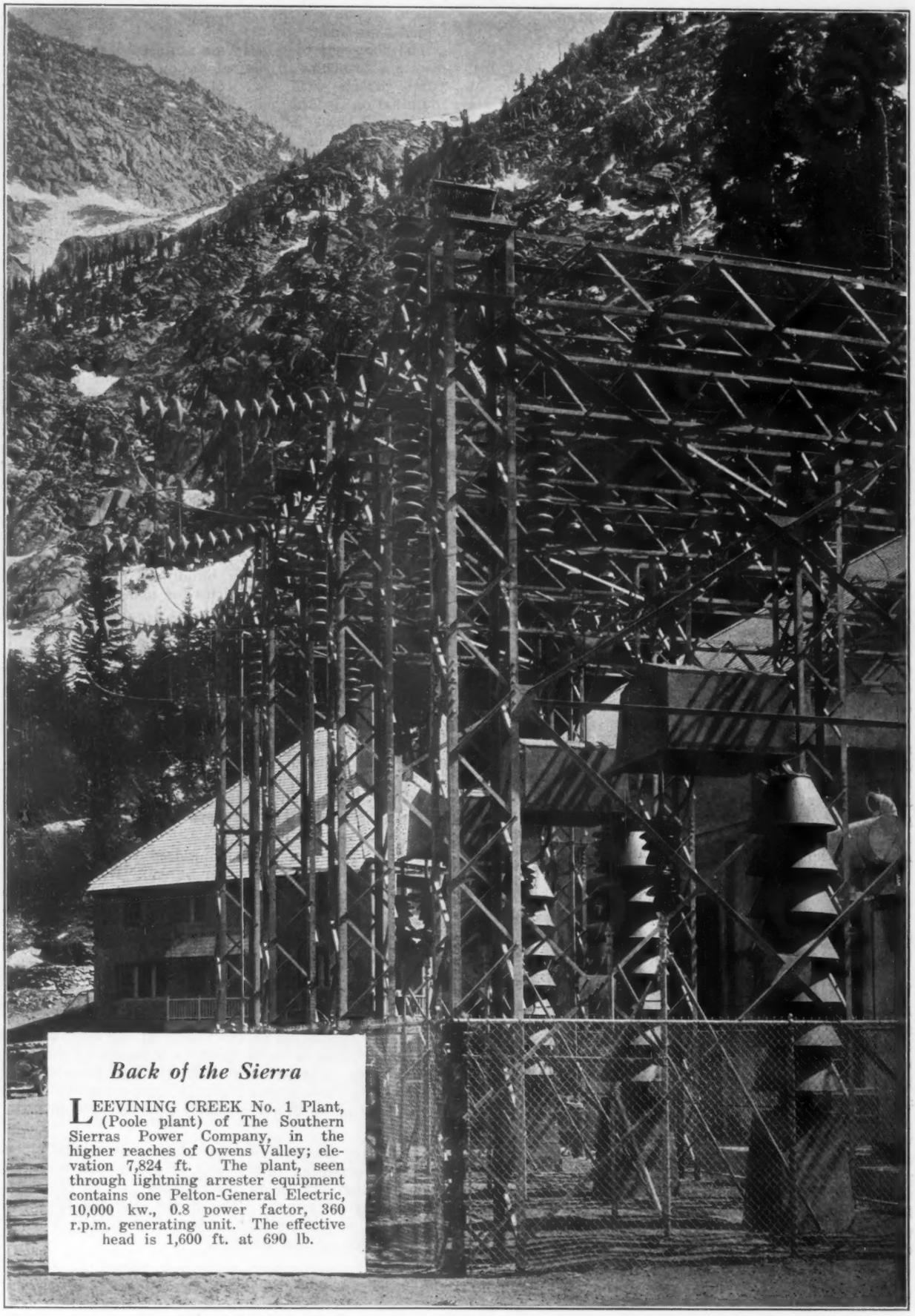
Ignoring the legal aspects of the case, over which the lawyers will have a good time instructing a judge in English nouns, the practical side is plain enough. If the power bureau knows its nouns aright then it is wrong for practically all power companies of the state to develop California industrially by the distribution of ever cheaper energy for the thousands of power and heating requirements of farm, factory, commerce and the home.

The contention of the power bureau may be absurd enough, but its implication is anything but funny. If this interpretation holds, it means that thousands of users of electricity for power and heating purposes in every part of the state are being served illegally. If the bureau is right, such services in every part of the state must stop, or else the users of electricity for whatever purpose must bear the burden of additional expense to secure electric service under other systems or under different conditions. Is this an effort to make necessary the extension of municipal or state ownership or is the bureau snapping blindly at anything which seems to it to have possibilities for making trouble?

If the bureau is correct in its legal English, then the practice of selling electricity for power or heating has been illegal for decades. Every electric range user, every electric-iron user, every curling-iron user, has been using illuminating electricity as some are known to use medicinal beverages. It should have been stopped at its inception, long before the Los Angeles power bureau existed and needed such a loophole to get it out of its difficulties. If the entire industrial, commercial and agricultural development of California is founded upon an illegal practice, it is something which should have been stopped with the first electric iron placed on the market.

It is a desperate situation indeed to find itself in, that which confronts the power bureau. When a private company, its one competitor, is able to give a service to the public of Los Angeles of such character as to embarrass this great political mechanism originally specified as a means guaranteed to save the people money and do all manner of fancy things, certainly such embarrassing competition must be removed at all costs. Just as the power bureau political engineers have announced their intention to build a steam plant, regardless of the opposition of the voters of the city, so this "franchise" idea is to be used as a means of forcibly annexing the electrical system of the Los Angeles Gas and Electric Corporation, its only competitor—this also in the face of an overwhelmingly adverse opinion from the voters.

The Better Business Bureau of the advertising clubs may find something in the way of interesting research as respecting "Truth in Advertising" in the columns of Los Angeles papers. The power bureau's advertising always says something to the effect that it belongs to the people of Los Angeles.

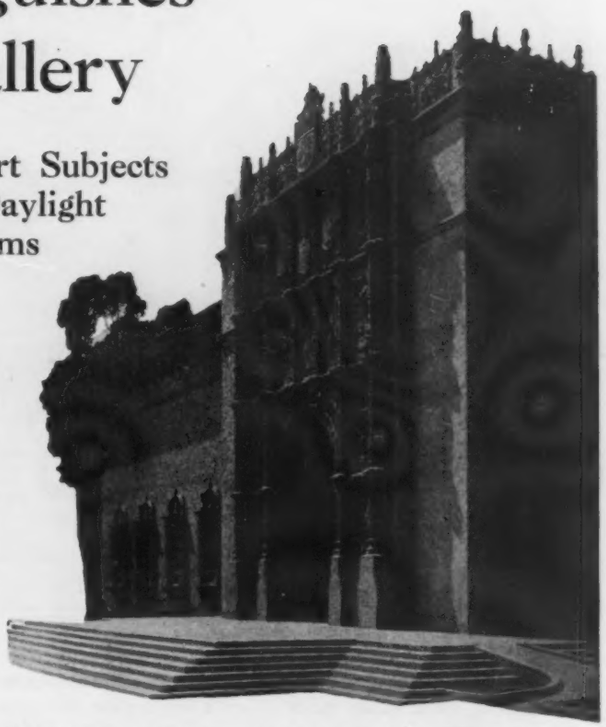


Back of the Sierra

LEEVINING CREEK No. 1 Plant, (Poole plant) of The Southern Sierras Power Company, in the higher reaches of Owens Valley; elevation 7,824 ft. The plant, seen through lightning arrester equipment contains one Pelton-General Electric, 10,000 kw., 0.8 power factor, 360 r.p.m. generating unit. The effective head is 1,600 ft. at 690 lb.

Illumination Distinguishes San Diego Art Gallery

Even Distribution of Light Over Art Subjects Achieved Through Combined Daylight And Electric Lighting Systems



Bridges Fine Art Gallery, at the head of the Plaza, Balboa Park, San Diego.

A VISITOR to one of the famous art galleries of Europe, if he happens to linger until the later hours of the afternoon, finds that he must grope his way through deepening shadows. Somehow, according to A. M. Powell, illuminating engineer of the Edison Lamp Works, the idea of electrification of these ancient treasure houses of art objects is looked upon with horror. Electricity is felt to endanger the safety of these precious treasures. And yet a common coal-oil lamp or candle with open flame is tolerated, perhaps because it is something to which everyone is used.

America is new to the collection of art treasures. Its galleries are comparatively modern structures. Moreover electricity, far from being regarded as hazardous to the collections of age-old treasures because it is utilized with full regard for its most mischievous capabilities and installations for its utilization are designed to safeguard it in every way, is considered the only safe and efficient agent for the illumination of American galleries. Ingenuity with apparatus for control of light, either by daylight or artificial illumination, characteristically American, contributes in a way never realized in Europe toward the display and protection of what art treasures Americans have been able to woo away from other parts of the world.

In the replacement of the 1915 and 1916 Panama-California Exposition Buildings in Balboa Park, the City of San Diego has adopted a program calling for the preservation of each building until such time as it may be replaced by a permanent structure. At the north end of the Plaza de Panama the first such permanent building was given the city recently by Mr. and Mrs. A. S. Bridges in the form of a Fine Arts Gallery. The plans for the structure, according to the donor's instructions, were to be sparing in no detail which would make the building at once the most artistic and at the same time most completely and efficiently equipped of its kind in America.

The architects, W. Templeton Johnson and Robert W. Snyder, therefore called into consultation some of the best known experts on art gallery illumination, both as to application of daylight and artificial light, while preparing the building plans. To Holmes and Sanborn, consulting engineers of Los Angeles, were entrusted the electrical and mechanical details and to the Southern Electrical Company of San Diego the electrical installation and construction of special fixtures. Each contributed to the effect now created by the finished equipment, for even after all theoretical details had been worked out and the installation completed, architect, engineer and contractor worked together to adjust the equipment to its fullest and most efficient application of lighting.

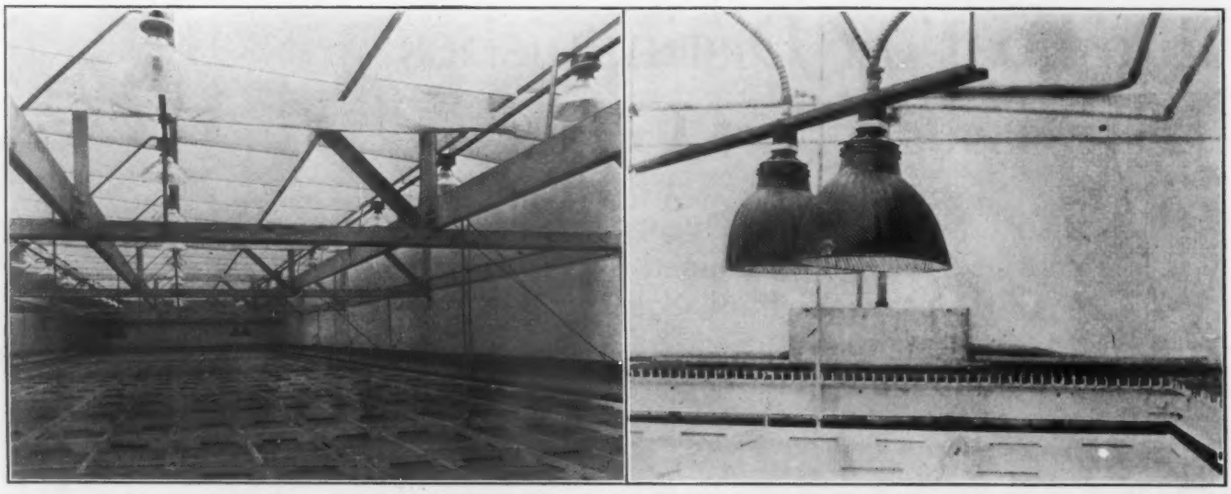
After consideration of the relative values of total daylight and total artificial illumination the architects decided upon a combination of both. For the lower floor galleries a series of large windows would furnish the daylight source. But for the second floor, with no outside windows, a series of skylights was designed, one over each separate gallery, to furnish the illumination.

Daylight Equipment Elaborate

For the control of the daylight H. I. Day, considered one of the foremost authorities on the application of daylight illumination to art galleries, was called in consultation. He in turn consulted with M. Lukiesh, illuminating engineer of the National Lamp Works. As a result of investigation the Kirby-Champeau system of daylight controlling devices was installed. This system consists of a large number of parallel canvas louvres, both on a horizontal and on a vertical plane, controlled manually by means of cranks operating pinion gears. It is elaborately verniered to indicate the proper degree of rotation to regulate illumination during the hours of the day, the time of the year, and for cloudy or rainy days. The movement of the louvres is thus calculated to keep the direct rays of the sun from striking the refractory or condenser glass forming the lower skylight which acts as the ceiling of the gallery itself.

Thus at noon, during the summer months, with the sun more nearly directly above the building, the horizontal louvres all are supposed to be closed to shut out the direct rays of the sun. In the winter this would not be necessary as the altitude of the sun in that latitude is about 55 deg. at the equinoxes.

The San Diego sunlight record stands well in favor of such an elaborate system to utilize sunlight. However, not to be satisfied with sunlight alone, but to provide a continuous and imperceptible changeover from daylight to artificial light during early morning hours



Above the gallery skylights. The canvas louvres for controlling daylight are plainly seen, as well as the supplemental illumination from artificial sources. The suspension method for the glass reflectors is shown. The arc welded, all-steel construction of the framework holding the glass ceiling plates also may be seen. For exra light over the corners the special reflectors in the right hand photo are used. These are adjustable as to height and spread.

and late afternoon, and to provide illumination for the evenings which will compare with the daylight illumination, a supplementary system of electric lighting was installed.

For the control of the light, from whatever source, the gallery skylight panels were made up of Holophane glass plates, each plate marked with an arrow to indicate its correct placing in the skylight. The light, coming from above the skylight, was bent by means of this glassware to play an evenly spread stream along the walls of the gallery where were to be hung the paintings and along which the sculpture or other objects of art were to be arranged. At the same time a general illumination over the entire room is maintained.

Artificial Lighting Arrangement

Suspended from the steel framework of the span arches over each gallery on the second floor, a system of artificial lighting was installed. In general it consisted of three rows of lamps and reflectors placed 5 ft. apart and with the lamps on 4-ft. centers. The lamps used are of 100 watts, and are mounted in Holophane reflectors. There are 14 lamps in each row in the two long galleries, (74 x 34 ft. in size), and 2 rows of 7 lamps each in the smaller gallery, (7 x 46 ft. in size). The lamps are suspended at a height of approximately 2½ ft. from the glass gallery ceiling.

In addition to the light from the skylight, in order to bathe the walls with a still greater wash of light,

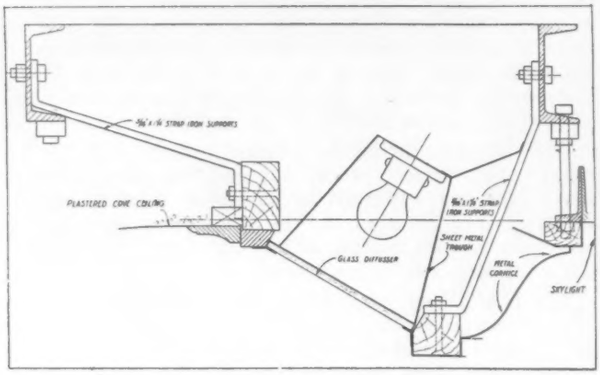


Fig. 1.—Method of supporting lighting trough around skylight.

around the entire skylight is placed a strip of lighting units embedded in the cornice and provided with Holophane condenser lenses which are designed to spread the light over the area of the walls. These units are tilted so that the axis of the light trough extended is designed to strike the wall of the gallery at a distance of 6 ft. from the floor.

The light trough is made of sheet metal, painted black so as to absorb or reflect no light. Each lamp is placed at the exact spot to center the filament with respect to the condenser so that the maximum illumination will be delivered through it. A drawing, Fig. 1, shows the construction of the light trough and its placing in respect to the skylight. An accompanying photograph of the gallery shows the effect of the trough lighting.

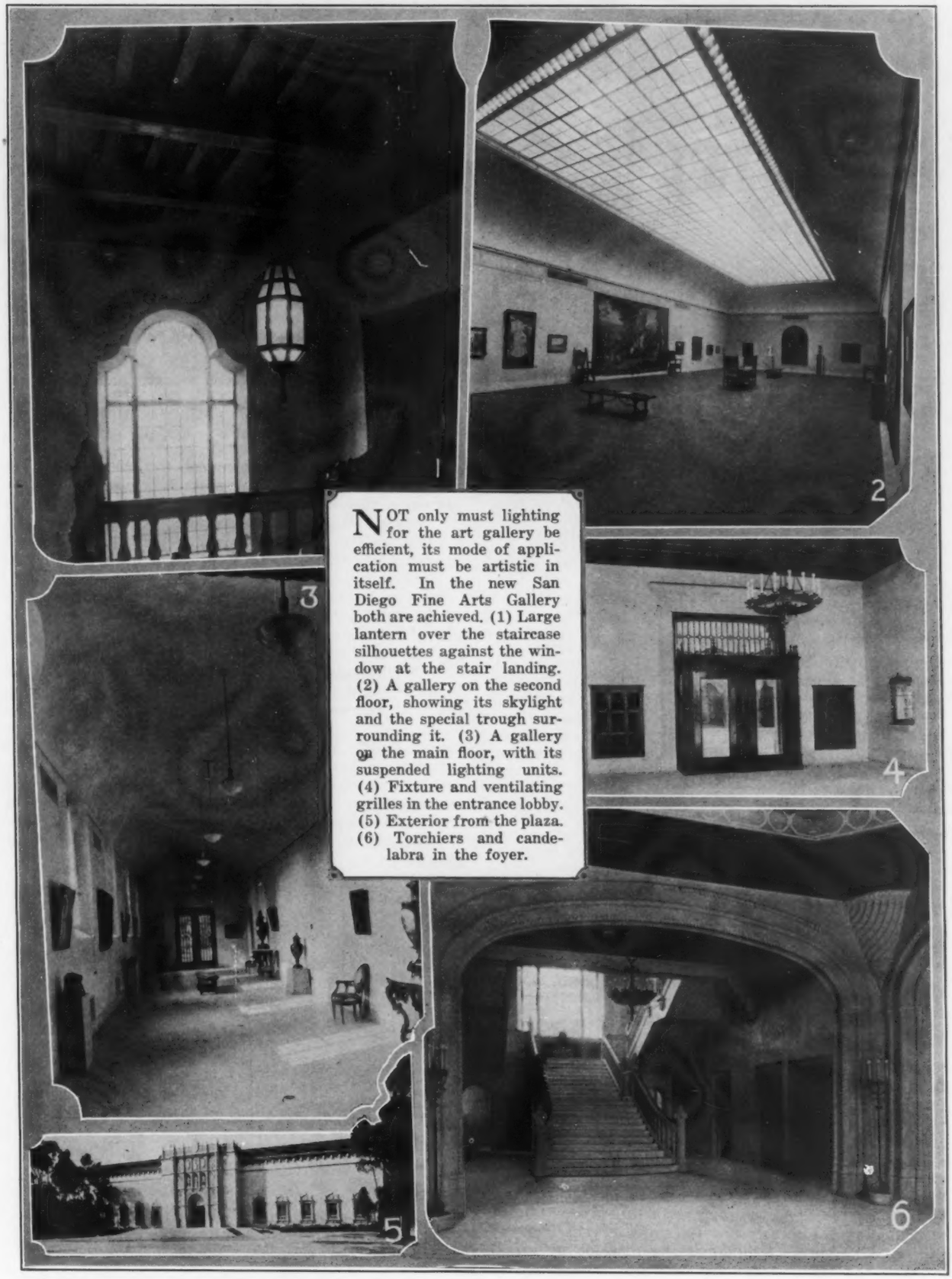
The over skylight lighting system was augmented by two Jumbo X-Ray reflectors at each corner, arranged to throw additional light into the corners of the room so as to bring the intensity at the corners to the same level as the walls in front of the troughs. These reflectors are mounted on an adjustable framework, suspended as shown in the photograph, in order that the spread of the light may be regulated.

As a result of this distribution system an intensity of 14 foot-candles is obtained over the wall area and of 11 foot-candles in the corners.

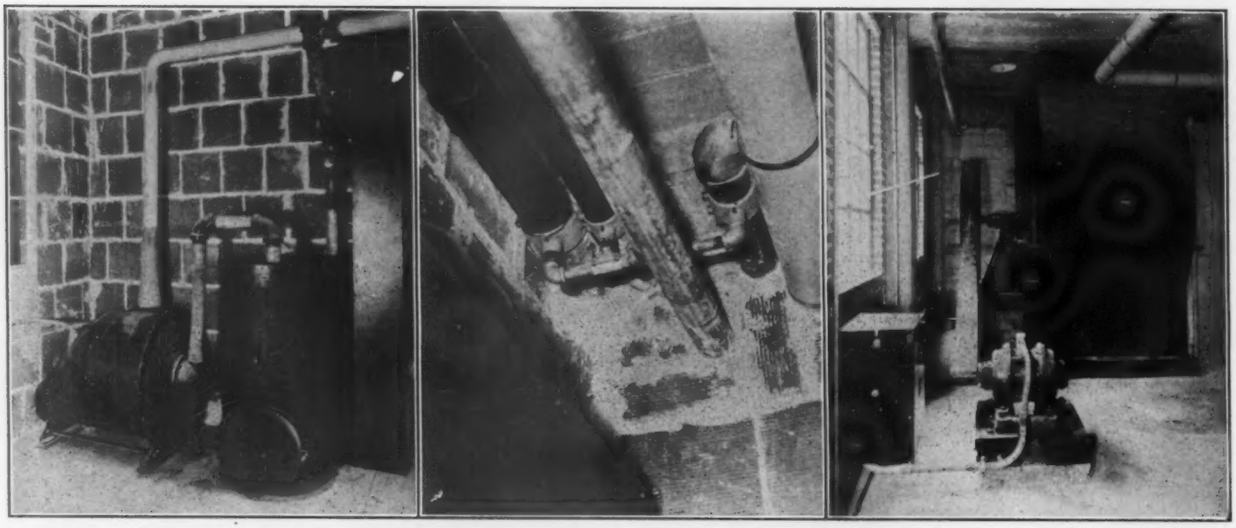
An elaborate system of steel walkways is provided over the gallery skylights to facilitate the renewal of lamps and the adjustment of the natural lighting louvres.

Lower Floor Galleries

To supplement the daylight from the windows on the lower floor galleries, of which there are two large and five small galleries, skylights being out of the question, a system of pendent lighting units of the semi-indirect type were used. The ceilings of the lower floor galleries are arched, bringing in a lighting distribution factor of a little more complicated nature. For the two long galleries (74 x 16 ft.), a single row of the semi-indirect units was suspended. The stock fixture did not meet with the approval of the architects and the Holophane Company was asked to provide a special fixture, designed to refract the light along the walls of the gallery.



NOT only must lighting for the art gallery be efficient, its mode of application must be artistic in itself. In the new San Diego Fine Arts Gallery both are achieved. (1) Large lantern over the staircase silhouettes against the window at the stair landing. (2) A gallery on the second floor, showing its skylight and the special trough surrounding it. (3) A gallery on the main floor, with its suspended lighting units. (4) Fixture and ventilating grilles in the entrance lobby. (5) Exterior from the plaza. (6) Torchiers and candelabra in the foyer.



Mechanical equipment of the art gallery is electrically operated. At left the stationary vacuum cleaning plant. Center: method of bonding circuits to grounded pipes. Right: the exhaust for the ventilating system.

The six units in the long galleries were placed on 12-ft. centers. For the smaller galleries (20 x 24 ft.), two rows of units, four in all, 9 ft. apart and on 12-ft. centers, constituted the lighting arrangement. A gallery 20 x 49 ft. was lighted with two rows of units, 9 ft. apart and on 12-ft. centers, using 6 units in all. Lamps of 200 watts are used in these units.

Floor Outlet Boxes Numerous

The San Diego Fine Arts Gallery is exceptionally well equipped with floor outlet boxes to make electricity available at almost any place in any gallery or in workrooms, offices or passageways. The two large galleries on the second floor have 8 floor boxes, each spaced three on each side and one at each end. The smaller galleries have from 7 to 12 floor outlets, while the main floor long galleries have 16, a row down each side and a row down the center.

The engineers made the system flexible enough to provide for still more outlets in the future by placing the pull boxes flush with the under side of the floor slab so that future conduit could be run from them to new box locations with a minimum of trouble. The conduit, it is planned, may be run from the pull box along the underside of the floor slab to the point directly below the desired floor outlet box. Future demands in the way of special or local lighting or for operating apparatus electrically are thus insured fulfillment.

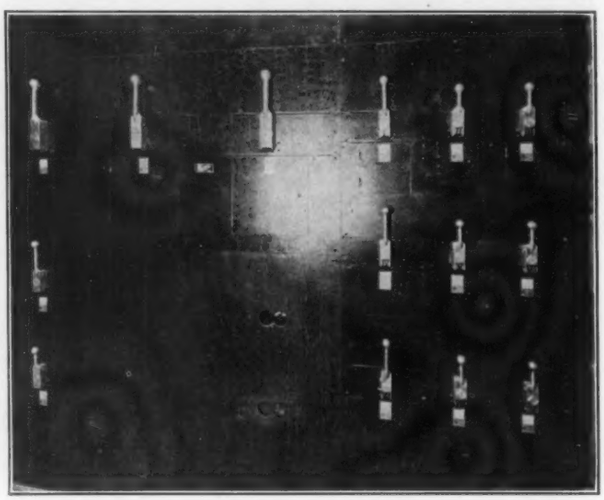
Fixtures, Other Apparatus

The lobby of the art gallery is made particularly attractive by the placing of candelabra fixtures at the four corners of the main lobby light well. General illumination is provided by the skylight above the light well, equipped for artificial illumination as well as for daylight. But the candle fixtures, both in torchiers and ceiling suspended units, are used for decorative purposes. A great lantern over the main stairway viewed from the second floor also lends an artistic touch and silhouettes effectively against a tall window at the stair landing. Concrete pedestal torchiers in front of the building entrance illumine the exterior at night, blending the building lighting with the illumination of the surrounding remaining exposition buildings.

The electrical and mechanical equipment does not stop with the lighting. A stationary vacuum cleaner system, a ventilating and heating system, an elevator, a fire alarm and an intercommunicating telephone system are also part of the equipment. While the electric load approximates 125 kw. in light alone, the motor load is over 100 hp.

To provide additional safeguards some of the lobby fixtures and gallery fixture lighting is on an emergency circuit so that light for leaving the building will be available under any condition.

In completeness of detail as well as in adequacy of illumination and preservation of the artistic atmosphere, the Fine Arts Gallery in San Diego is claimed to be one of the most up-to-date in the country by those who have visited the art galleries of the world. Because its design was accompanied and guided by a foresight into future demands and because it is a fireproof and well built structure it may have a place in establishing in America a tradition for art which it should be capable of maintaining for years to come. At least the physical foundation for such an institutional work is present.



Main switchboard of dead front construction. Note the glass peepholes through which to read the meters.

Power, Progress and Prosperity

By D. C. Green*
Vice-president and general manager, Utah Power & Light Company, Salt Lake City

IN the year 1600 William Gilbert, a physician in Queen Elizabeth's court, published a treatise covering years of research in electricity. A century and a half later, Benjamin Franklin charged a leyden jar with electricity brought down from the clouds. It was nearly another century and a half, 1890, before there was 15,000 hp. being generated in the United States. Nine year later, 1899, this had grown to 500,000 hp. In another ten years, 1909, it had increased to over 4,800,000 hp. and at the end of the year 1926 the combined station capacity was 33,500,000 hp. Within a lifetime, therefore, we have seen electricity made the servant of mankind and brought to its present development. Its greatest development has been within the last twenty years. Should we then wonder that our neighbor does not understand more about our business, when, perhaps we ourselves only found the answer yesterday?

D. C. GREEN

Through our National Electric Light Association we are able to learn the capital expenditures and gross earnings annually of all the companies in the United States. These amounts run into many figures, but if we had the same information regarding other lines of business, such as retail groceries, clothing stores, steam railroads or oil companies, these figures would indeed seem very small. The total electric bill of the nation for all purposes is less than that for candy and tobacco, and the cigarette bill alone is more than 50 per cent of the cost of electric service in all the homes in this country. In Salt Lake City, the picture show and theater bill is four times the cost of lighting the home. In the state of Utah the gasoline and oil bill is six times the electric bill for residential service.

Our business is looked upon as a monopoly, and it indeed is a natural monopoly, due to its nature and the fact that one company can better serve a community and at a lower cost than several companies. On the other hand, we know, but the public generally does not know, that our business is a highly competitive one. There is no law in any state that requires a factory or a mine to purchase its power from the electric company. They purchase power for the sole reason that the cost is cheaper than they can produce it themselves. The electric light and power companies in this country generate more electricity than those of all the other nations of the world combined. In this country less than 5 per cent of the power generated is produced by government, state, or municipal plants. In foreign countries they have been largely politically owned, although they are now asking private capital to take them over, and this has recently been done in several cities.

The United States of America with only 7.2 per cent of the world popuation, is today the wealthiest and most prosperous nation of the world. The wealth of the world when our Constitution was signed, was one hundred billion dollars; the wealth of the United States alone today is three hundred twenty-five billion dollars. I attribute this to the fundamental principles laid down by our forefathers—that the government should not enter any business that could be conducted by its citizens, thereby encouraging, developing and rewarding initiative on the part of its people. As proof of the soundness of this principle, I will cite an example in our own industry. The electric light and power service in the city of London has always been owned and operated by the boroughs of that city, politically owned, and the consumption of electrical energy in that city today is slightly in excess of 100 kw-hr. per capita per year. Contrast this use with the average of the whole United States, which is 621 kw-hr. per capita per year, and, may I modestly state, with that of the territory served by the Utah Power & Light Company, of 1,875 kw-hr. per capita per year, or eighteen times as great as the city of London. If political ownership then is for the best interests of the public, why should the electrical development in this country outstrip all other countries of the world. The wages, and, most important, the standard of living of labor in this country is the highest in the world, and commissions recently sent here by foreign nations to find the reason for these conditions, attribute them to cheap electric power in this country.

William Green, president of the American Federation of Labor, in his address before the National Electric Light Association Convention, June 8, said:

"The American worker is highly efficient. Electric power and machinery enable him to use that efficiency to its fullest capacity. An analysis of the industrial situation shows that electric power is the greatest con-

* Excerpts from the President's Address, Northwest Electric Light and Power Association Convention, Salt Lake City, June 21-24, 1927.

tributing factor toward the increase in the efficiency and productivity of the working people of our country."

And as to Government or political ownership, he said:

"Industrial freedom is as essential to human happiness and human welfare as political freedom. Let us hope that our nation will always remain free from governmental, autocratic and dictatorial control of its industries and its workers. The workers prize these blessings and benefits very highly because they mean more to them than to other classes of our citizenship. They cherish them as priceless rights and they are determined to transmit them as a heritage to their children and to succeeding generations."

Who owns the electric light and power companies of this country? The stock records of these companies will show that they have over two million stockholders, and the bonds are largely held by banks and insurance companies, of which the public are depositors or policy holders. Take for example the company with which I am associated; the number of local stockholders is equivalent to one out of every seven and one-half residential customers, and the annual dividend on our preferred stock paid to local stockholders, $876,000, is equal to $11.60 per residential customer served.

The local city, county and state taxes paid by this company, $1,000,828, is equivalent to $13.25 per residential customer served. The total of these two items, $24.85, is greater than the average annual lighting bill per customer served. Although we do not have a record of ownership of bonds, we have sufficient information to make the statement that the amount of bonds of this company held locally is equivalent to the amount of municipal and state bonds owned locally.

Contrast this form of ownership with political ownership. Not many of our customers own government, state or municipal bonds. The entire financing of a politically owned power system would be through the issuance and sale of government, state, or municipal bonds. I submit, therefore, that we now have a more direct ownership and management of this company, by the public served, than if it were politically owned and managed.

It is significant to note that some politicians who are urging that the government go into the power business, find it necessary to use flood control as a smoke screen. It is obvious that a reservoir should be empty to effect flood control, and likewise obvious that it should be full to generate power. Another group are trying out the experiment of telling the people of each state that their rates are too high and that they should be fixed by a national commmission at Washington, instead of by local state regulation composed of men who live at home and know the local needs and conditions. Do you think that one of our customers, who has an honest difference with our company, would want to go back to Washington and place his case before the fourth assistant to the third assistant to the second assistant of a politically appointed bureau? The purpose back of this movement is to nationalize the issue and, with such form of regulation in effect, to perhaps hamper and retard the development in this industry, thereby making it possible for them to say at some future time that government ownership is necessary in order to meet the public needs for electric power service. Others make the bold statement that the "Power Trust" is a menace to the future prosperity of the nation and they rely on the psychological effect of the word "trust" to prejudice the public against our industry and to sweep them into office, as Moses leading them out of the wilderness.

But the answer to all these false and socialistic dreams is apparent when we find that not one of them has ever made the statement, nor even implied that our industry has not efficiently served the public needs. The socialization of the electric industry in this country is but one step in their program of socializing all other classes of business, and this movement will never be endorsed by the laboring man and the business man in this country.

Our government has already made some steps toward putting the government in business, and this has been brought about by that class of people who say, "I am against the government going into business, but in this particular case I think it would be all right." I believe that those sponsoring the government in business will meet with a more determined objection on the part of the public generally in the future.

Electric service today plays a part in every phase of our daily life, in the home, the store, the factory, and in transportation. The public appreciate the bigness of the service that is being performed by our industry, but when they go to measure its size they naturally use the dollar mark as their yard-stick, and it is for that reason that I have given comparative gross earnings figures of our industry, with other classes of business. I think many who have not already made these comparisons will honestly admit that the business in which we are engaged is not nearly as large as we thought it was.

The average cost of electric service in the home is seventy-five one hundredths of one per cent of the average family budget. There is only one item smaller, as given out in the Department of Labor statistics, and that is "postage and stationery."

The cost of power in industry is from ½ to 2½ per cent (with some few exceptions) of the total cost of the finished product. I think it is important that in the future we should see to it that the public is given these facts regarding our business.

May I offer a suggestion as to how we can best carry out this program? I would say, begin at home. See to it that each and every employee of our companies knows more about our business, and put him in a position to answer intelligently the every-day questions asked him by his neighbor. A cross-section of the employees of our companies is a cross-section of the community we serve, and if each employee is able to inform intelligently his circle of friends of the true facts in connection with our business, we will have covered the entire community we serve. I think this will be far more effective than a company-paid, silver-tongued orator taking up the people's valuable time at a Fourth of July celebration. A few facts told by an employee over the back fence to his neighbor will be far more effective than the same facts told over the foot-lights.

I have referred to the nation's prosperity, and the high production and high wages of labor, and have attributed these to the increased uses of electric power. This, then, should remind us of the responsibilities that rest upon our shoulders in the future. To compete with the markets of the world we must keep this nation in the forefront in efficient production and this in turn will involve further electrification of industry. We can play a great part in maintaining our country's prosperity and happiness, and, when we go back to our jobs, let us go back with renewed determination to meet our obligations of serving the nation's electrical requirements efficiently and at the lowest possible cost.

Co-ordination of Power and Irrigation Interests

By J. C. Stevens*

Stevens & Koon, Consulting Engineers, Portland, Oregon

THERE are many streams in the West the waters of which are in demand for both hydroelectric power and for irrigation. A stream cannot serve two masters and do full justice to each. Its waters cannot be completely used for the production of alfalfa and at the same time for kilowatt-hours.

While much has been done in a number of localities to harmonize these divergent uses, nevertheless a divergence of interest is ultimately inevitable wherever the entire annual water supply is to be utilized. In many localities these differences have not been apparent because either irrigation or power, or both, have not as yet demanded a complete utilization of the total available supply.

IN GENERAL terms the author outlines the flow characteristics of Western streams in relation to the irrigation needs of the territory and suggests a basis for co-ordinating the power and irrigation interests.

In other localities this incompatability of interest has only been evidenced by a slight irritation that has frequently been cured, for the time being at least, by the parties at interest sitting around a conference table and coming to some amicable agreement as to the division of that portion of the available supply that each wishes to utilize. In other situations legal proceedings have been instituted, and the courts have been called in. Court decisions, however, seldom effect a permanent cure. They merely decide the issues immediately at stake and seldom look ahead or anticipate future complications.

In still other localities, notably in California, the situation has become so acute that extensive regulation by storage has been resorted to by one or both parties. On some streams complete systems of storage reservoirs and power plants have been developed on the upper reaches of the stream for hydroelectric purposes only, and another entirely independent system of storage reservoirs and distribution canals has been built on the lower portions for irrigation alone.

Although this plan is obviously expensive it appears to be the most effective means of completely harmonizing the use of the entire stream yield for both purposes. Unfortunately, however, watershed topography is not always favorable for such a solution, because suitable opportunities for storage are not always to be found. In such cases, can the two uses be completely harmonized? Bluntly the only answer is "No." It is futile to soft-pedal the answer. We may as well face the problem and admit that differences are, or will be, inevitable wherever the entire annual yield of a watershed is to be fully utilized for irrigation and also for power.

Let us look into the reasons for this divergence of interest. Let us examine the situation in general terms, and make our inquiries not from a narrow localized point of view, but from a mountain top where we may have an unobstructed view of the entire field.

Practically none of the rivers of the country has flow characteristics that coincide with either the power or the irrigation demand. It is obvious, therefore, that if the fullest use is to be made of the total yield of watersheds, extensive artificial storage and regulation are inevitable. In general, the more uniform the flow of a stream the more useful it is in its natural state, whereas the greater its variation the greater the necessity for reservoir regulation. Uniformity of flow is, however, of secondary consideration in watersheds where there are feasible reservoir facilities to conserve the entire supply.

In the West there is much more land suited for irrigation than there is water to supply it. Practically all land that can be irrigated from the unreserved supply has been under irrigation for many years. The expansion of irrigated areas, therefore, must depend in the main on reservoired water supply. On this account it is safe to state that in the arid West the important river characteristic is total annual water yield rather than uniformity of flow. It is obvious that if the total annual yield of a watershed is to be used for irrigation, sufficient storage capacity must be provided to make that supply available during the irrigation season, and it makes no great difference whether that supply accrues gradually throughout the year or within a few months.

Irrigation Demand

Passing from the southern to the northern limits, or higher altitudes, of the West the irrigation season becomes shorter, with correspondingly greater variation in the monthly irrigation demand. In order to illustrate this point the water requirements for typical irrigated sections of the West are shown in Fig. 1. It will be noted that the maximum monthly demand varies from 13 per cent of the yearly total in the Imperial Valley to 34 per cent in the Klamath district. It is obvious, therefore, that for equal land areas and equal yearly water yields, reservoir capacities and distributing canal capacities must be relatively greater as we go northward, if the same yearly total of irrigation water is applied. There appears to be no relation between the net yearly duty of water and the intensity of its application, this being governed by factors other than climatic. For example, the water requirements of Imperial Valley with a 12-month irrigation season are no greater than those of northern Washington with only a 5-month season; but the intensity of application in the northern district is double that in the southern, hence for equal water supplies, reservoir and canal capacities per acre in northern Washington must be twice those of

* Extracts from a paper read before the fourth annual general meeting of the Engineering Section, Northwest Electric Light and Power Association, Portland, March 9-10, 1927.

southern California to give the desired degree of regulation.

Power Demand

The only common characteristic between irrigation and power demand is that represented by the irrigation pumping load. Fig. 2 shows the monthly power output of five large power systems of the West. The demand

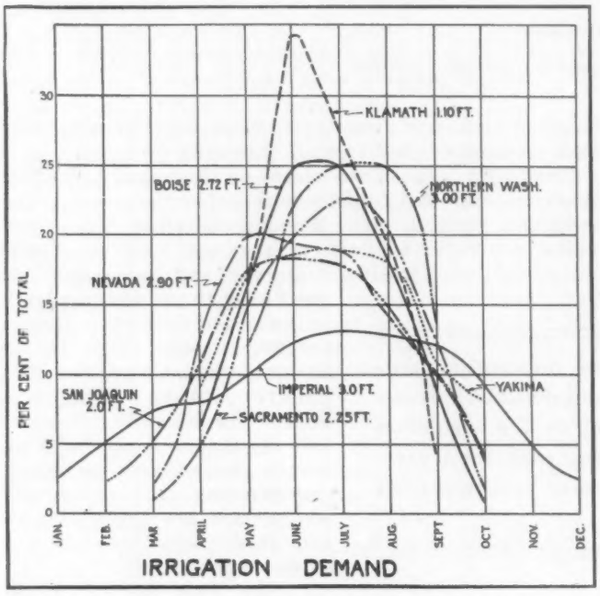


Fig. 1. Irrigation demands in various sections of the West.

of the Idaho Power Company shows the greatest relative demand for irrigation pumping, with the Southern California Edison Company second. For comparison a typical lighting load is shown on the same diagram. It will be noted that the load characteristics of the Idaho Power Company are quite symmetrically opposite to those of a lighting load, due almost exclusively to irrigation pumping. The figures opposite the names of the power companies give the total output in millions of kilowatt-hours for 1924.

Comparing Figs. 1 and 2, the reason for a divergence of interest, where the same total water supply is desired for both irrigation and power, is at once apparent, because the same water is required at different periods of the year.

Reclaiming the West.

In round numbers there are 44,000,000 acres of irrigable land in the Western states; irrigation water is already available to 19,000,000 of acres. In other words, the job of irrigating the West is only 43 per cent complete. The greater part of this 43 per cent has been irrigated with comparatively little stream regulation by storage, but nearly every one of the remaining 25,000,000 acres, or 57 per cent, must be irrigated with the aid of stored water.

For the irrigation now in effect, between a third and a half of the available stream flow is being utilized, and this portion includes all the natural summer flow of the streams and in addition that from such storage as has been developed to date. Of the 19,000,000 acres now supplied with water, 16,000,000, or 84 per cent, are supplied by gravity and the remainder by pumping. There are 15,000,000 additional acres that can be supplied by gravity, but there will be no water available for them unless storage reservoirs are built to hold winter supplies over for summer use.

Power for Irrigation

Water may produce alfalfa by first being converted into kilowatt-hours and then used for pumping just as truly as if run in field furrows. In such use there can be no incompatability of interest. Unfortunately, however, the potentialities in this regard are limited in a general sense, although in a local sense they may be of paramount importance. Of the irrigated area 3,000,000 acres are now watered by pumping, and 10,000,000 acres of the unirrigated area will require pumping for their reclamation. The present area supplied by pumps is 16 per cent of the total, but when the job is complete 30 per cent of the total irrigated area will be watered by pumping.

An analysis of over 200 pumping plants irrigating about 300,000 acres, in various Western states, has been made. These may be taken as a fair index of the pumping demand. An acre-foot of water lifted one foot represents, for all practical purposes, the same amount of energy as a kilowatt-hour. The average consumption of the 200 pumping plants was 2.1 kw-hr. for each acre-foot of water lifted one foot. The average over-all efficiency of this group of plants is therefore 48 per cent. The average lift was 40 ft., and the total consumption 51,000,000 kw-hr. per annum.

If pumping to the 3,000,000 acres now so irrigated had been done entirely by electric power, it would represent a consumption of half a billion kw-hr. annually. The total power produced last year in the Western states, where irrigation is practiced, was 15,000,000,000 kw-hr. of which the above pumping load would represent only 3 per cent. To water all the 13,000,000 susceptible acres by electric pumping would require 4,000,000,000 kw-hr. annually, but by the time this shall have been accomplished the total Western power output will have reached an annual total of 100,000,000,000 kw-hr., more or less, so that the pumping load can never exceed 3 or 4 per cent of the total Western power load. Pumping as a possible power market is thus seen to be quite limited from an all-Western viewpoint, though from a localized viewpoint, it may assume important proportions.

Broadly speaking, it is obvious that even future requirements for irrigation pumping cannot materially alter the present general power load characteristics, and

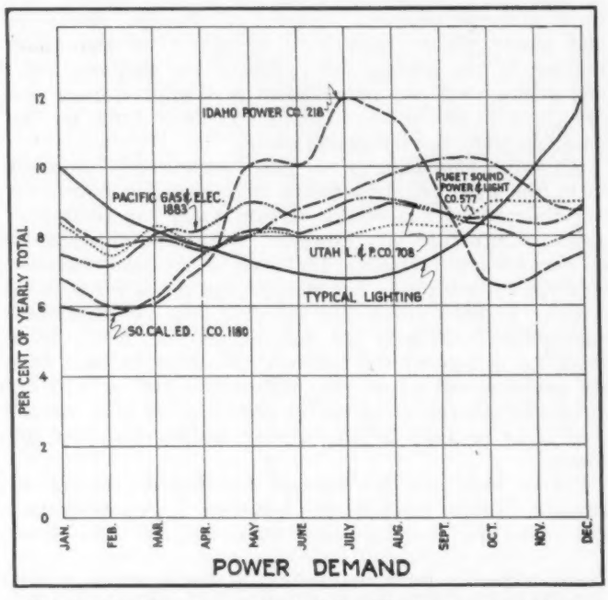


Fig. 2.—Monthly power output of five Western power systems.

that it will not always be possible to find a sale for all power that can be developed at the outlet works of irrigation reservoirs, or that may otherwise result as a by-product of irrigation, because this power must of necessity have irrigation demand characteristics, while the general power demand differs materially therefrom. The correlation of the diverging demands where total watershed yields are desired for both power and irrigation cannot be accomplished entirely, therefore, by the utilization of irrigation by-product power.

Power Demand and Population

The general power demand is largely a function of population, within the territory served. For every agriculturist there must be three or more urbanites to maintain an industrial balance. The growth of power demand per capita is, therefore, at least triple that per agriculturist. It would appear wise, therefore, for power interests to encourage agricultural growth to the limit. Moreover, it appears to have just dawned on many of us that the farmer may represent a fruitful power market, to which heretofore but scant attention has been given.

The demand for food stuffs increases directly with the population, whereas the demand for power is increasing many times faster than the increase in population. The next decade will see an enormous growth in power production and no one can predict when the saturation point will be reached. On the other hand, the growth of agriculture will be comparatively slow, the saturation point having been reached many years ago. Fig. 3 shows the growth of population and the growth of power demand per capita during the past 22 years. Population, and with it the demand for food stuffs, has increased 44 per cent, being compounded at the rate of less than 2 per cent per annum, while the per capita power consumption has increased 17 times, being compounded at the rate of nearly 14 per cent per annum.

Since we agree that every effort should be made to stimulate rural populations, and since this will directly and indirectly stimulate the demand for more power, it would appear that power interests will be substantial gainers in the long run by conceding irrigation the preferential right to the waters of the West; and by withdrawing magnanimously from the field wherever such action appears necessary to amicable settlement of conflicting interests. Let us assume that we all agree to accept this philosophy for the moment without further argument. We will be intensely interested then in gaining some idea as to how much water still will be available for power from the irrigation streams if we concede to irrigation the superior use and take what is left for power.

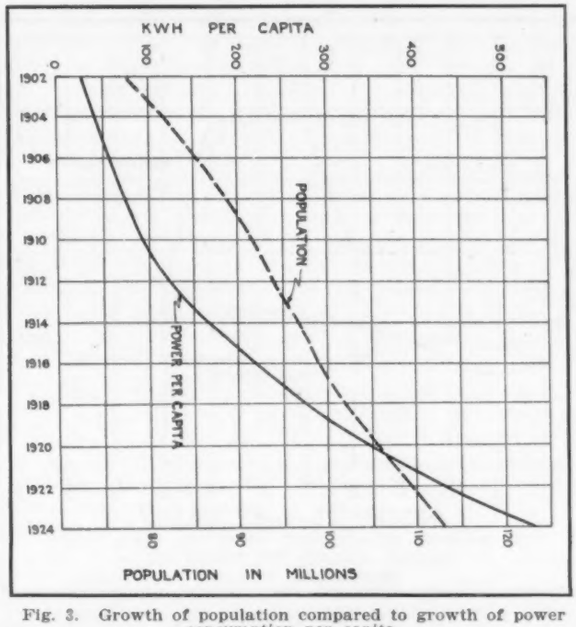


Fig. 3. Growth of population compared to growth of power consumption per capita.

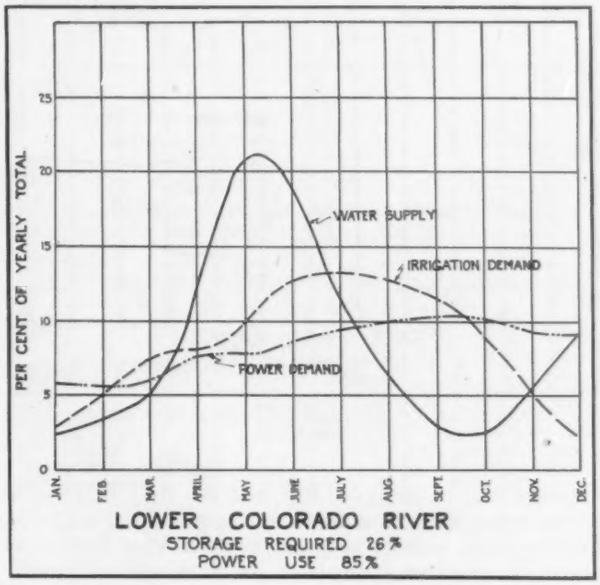


Fig. 4. Water supply and power and irrigation demands on Lower Colorado River.

Figs. 4 to 8, inclusive, have been prepared to show the present characteristics of stream flow, irrigation, and power demand in five representative districts. Each is expressed in relative terms, i.e., in percentages of yearly totals, and thus may be accepted as indicative of future as well as present conditions, of a time when the entire yield of the streams of the West will be put to their fullest use for irrigation, and the gretaest number of kilowatt-hours is also being taken from the same waters but without interfering in any way with their use for irrigation.

Since each curve is expressed in per cent of total, the area enclosed by each curve is the same and equal to 100 units. Stream flow characteristics are based on minimum years, but those for other years would not be materially different. Any of these curves can be converted into absolute quantities once we know the yearly totals. On each of the diagrams the extent of artificial storage required for complete utilization of the supply for irrigation is indicated in percentage of the yearly supply, also the proportion of the annual water supply that can be used for power after irrigation requirements have been satisfied.

Fig. 4 shows the characteristics of the Lower Colorado River Valley. Of the flow of the Colorado River, 26 per cent will have to be stored to render the entire supply available for irrigation. This would amount to 2,800,000 acre-ft. for the average low-water year. The U. S. Bureau of Reclamation has placed 2,300,000 acre-ft. as the limit of storage required for all lands susceptible of irrigation in both the Upper and Lower Basins, as there is not quite sufficient land to utilize the entire water supply. If this river were completely regulated by storage for irrigation, 85 per cent of the water supply could be used for power without interfering with irrigation. This would mean the possible annual distribution of 700,000,000 kw-hr. for every 100 ft. of fall utilized.

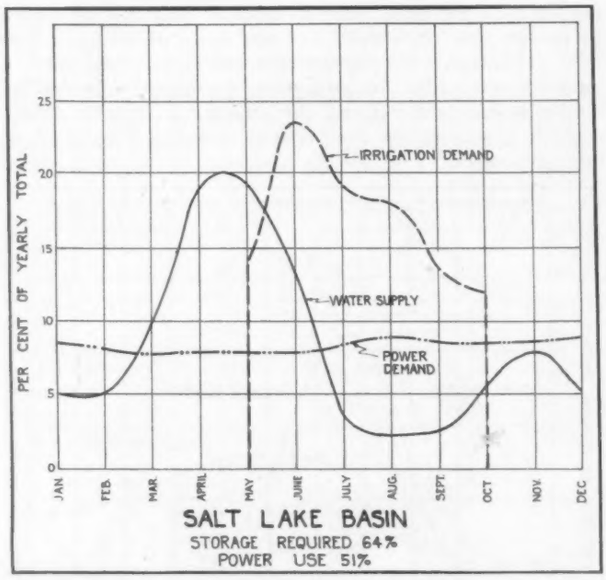

PER CENT OF YEARLY TOTAL
IRRIGATION DEMAND
WATER SUPPLY
POWER DEMAND
JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
SALT LAKE BASIN
STORAGE REQUIRED 64%
POWER USE 51%

Fig. 5. Water supply and power and irrigation demands in Salt Lake Basin.

In the Salt Lake Basin, Fig. 5 shows that 64 per cent of the water must be stored for irrigation and that one-half the yield may be used for power. This basin furnishes an excellent example of the correlation of power and irrigation. Nearly all water used for irrigation is also used for power somewhere in its route from mountain to lake.

Fig. 6, representing the Boise Valley, shows that 47 per cent of the total water supply must be stored and that 59 per cent of this supply may be used for power without interference. The power characteristic curve reflects strongly the irrigation pumping load. If we should substitute the typical lighting characteristics curve for the power curve, we would find that the non-interfering power use would drop from 59 per cent to 17 per cent, which illustrates the importance of the pumping load in this local district.

The characteristics of the Deschutes River Valley, shown in Fig. 7, are particularly interesting. The flow of the stream is remarkably uniform, but irrigation demands that the entire supply be used in five months. If any stream merits preference for power over irrigation, Deschutes River may legitimately lay claim to that distinction.

In spite of the remarkable uniformity of flow, 64 per cent of the annual supply must be artificially stored for complete irrigation. On the other hand if the water of this stream were reserved for power the entire supply could be so used by storing only 6 per cent of it. In terms of acre-feet passing Bend, a small reservoir of 60,000 acre-ft. would completely regulate the stream for power purposes, whereas the storage of 640,000 acre-ft. is required to accomplish the same purpose for irrigation. If so regulated for irrigation, only 40 per cent of the upper river supply will be available for power without interfering with irrigation.

In this basin it is proposed to construct reservoirs having an aggregate capacity of 525,000 acre-ft. which will furnish complete regulation for the irrigation of all available land during the year of least supply. It is also proposed to construct a reservoir of 100,000 acre-ft. capacity on its principal tributary, Crooked River, to be used entirely for power on the lower river, thus regaining to some extent the power possibilities lost by giving Deschutes River water preferential irrigation use.

If the streams illustrated may be accepted as representing a fair cross-section of the co-ordinated power and irrigation possibilities of the West, we find that to make the entire water supply available for irrigation will require that storage reservoirs be built to contain 36 per cent of the total low-year supply, and that if that were done power use may be made of 64 per cent of those waters without interfering with its use for irrigation.

It should be emphasized that the foregoing data and deductions are in general terms, and are presented to show characteristic tendencies only, without in any way attempting to outline specific projects or supplanting studies that have been made in particular cases.

Definite water supplies, definite storage opportunities, definite lands to be irrigated, and specific power demands, coupled with a spirit of co-operation and an eye to future advantages rather than immediate profits are essential prerequisites for the solution of each local problem.

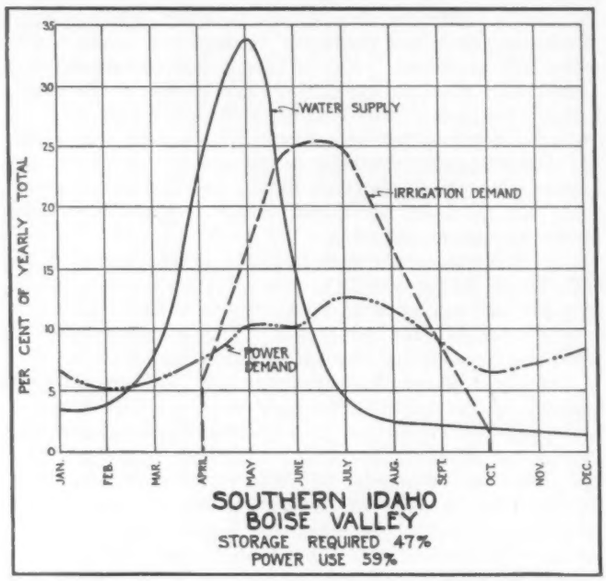


Fig. 6. Water supply and power and irrigation demands in Boise Valley.

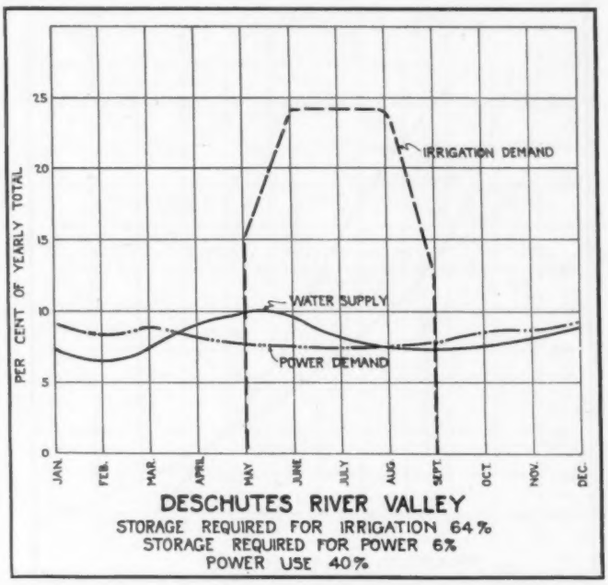

PER CENT OF YEARLY TOTAL
IRRIGATION DEMAND
WATER SUPPLY
POWER DEMAND
JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
DESCHUTES RIVER VALLEY
STORAGE REQUIRED FOR IRRIGATION 64%
STORAGE REQUIRED FOR POWER 6%
POWER USE 40%

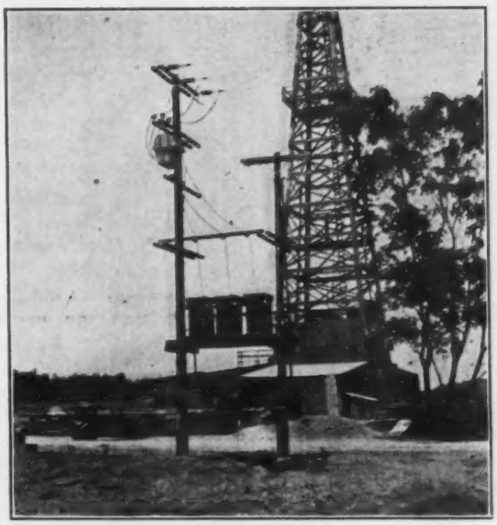
Fig. 7. Water supply and power and irrigation demands in Deschutes River Valley.

Electrical Distribution Systems for Oil Fields

By G. M. Crawford,
General Engineer, Westinghouse Electric & Manufacturing Company

AS OIL field electrification continues and becomes more universal, greater study must be given to the subject of suitable and correctly designed power distribution systems, which certainly are of no less importance than those now serving residential and industrial districts. In only a very few cases has a detailed and careful study been made with regard to the most economical, reliable and flexible system to be employed. The failure to make suitable observations and to study conditions carefully before making an installation undoubtedly has resulted in unnecessary energy losses in some cases and excessive operating and investment costs in others.

Early installations were made in a more or less haphazard manner, characteristic of former oil field methods. During this period matters pertaining to greatest efficiency interlinked with greatest economy were of little consequence to the average operator, either large or small. However, recently a transformation has been taking place in which improved production methods and apparatus are playing a large part. In other words, the great wealth of engineering knowledge, which has been applied so successfully to other industries of equal importance now is being applied to the petroleum industry as a whole. This is particularly true in regard to pumping and drilling equipment and production apparatus in general.



Three single-phase transformers supplying power for drilling in a California field.

The problem of oil field electrification is divided into two main and equally important parts: first, that of furnishing power to the customer, and second, that of utilization of the power by the customer in the most efficient manner. It is usual practice for the power company to erect a suitable transmission line terminating near the center of the field where a main substation of sufficient capacity to serve the area is erected. Then the consumer's important problem is that of laying out the distribution system. The successful operation of the electrical equipment generally will depend upon this one item alone. In regard to this subject, it is not the purpose of this article to give complete engineering data, but only to point out some of the basic principles which should be considered before making a systematic study of any layout.

Generally, the operating conditions will determine the type of distribution system best adapted to the field in question. In the case of some foreign installations, public safety regulations impose restrictions relative to the value of the distribution voltage and type of overhead line construction which otherwise might be desirable from the operating viewpoint. However, this does not greatly affect the problem in this country.

The first cost and consequently the fixed charges upon any system will depend usually upon the amount of flexibility desired and the degree of reliability realized. If the nature of the pumping wells is such that shut-downs for short periods of time due to transformer failure or line trouble are not serious other than the loss of immediate production, some sacrifice in quality might be made, resulting in reduced initial cost. Some installations of drilling equipment, such as electrically-operated cable tool rigs, can be served by a less reliable distribution system than a rotary rig, the shut-down of which, due to power failure, might result in serious damage.

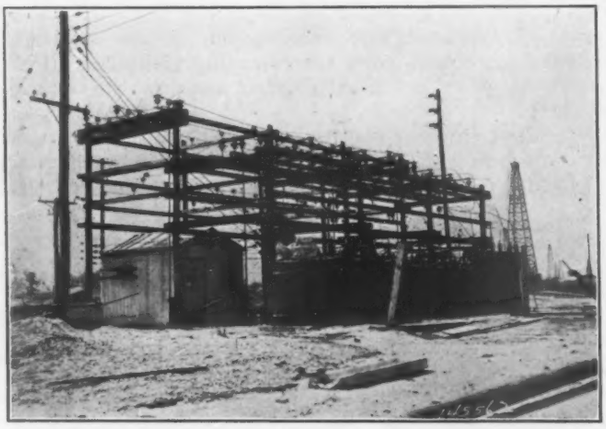
The life of the field also has an important bearing upon the problem of distribution in that it determines to a great extent whether the installation shall be of temporary or permanent nature. However, it is believed that the best policy is to stay away from temporary construction, especially for pumping areas. Such construction is apt to prove unreliable and to result in production losses that greatly overbalance the extra cost required to build a system of more permanent construction. Prevailing indications are that the life of the average oil field is not short and in many cases fully justifies the erection of a more or less elaborate power distribution system.

Probably the most elaborate distribution systems have been installed in foreign fields, where production is carried out on a more conservative basis than is the usual practice in this country. The fact that a good many years are required to develop a field and extract the oil fully justifies such a procedure and undoubtedy pays dividends in the end. The class of labor available also is a controlling factor, making automatic and foolproof equipment more desirable than otherwise.

As an example, in a certain Asiatic field in which labor conditions are bad and where continuous pumping operation is necessary, the network system of distribution has been applied extensively. Individual wells are so interconnected that power may be supplied from several sources over entirely different circuits so that the load may be shifted at any time and thus each transformer bank may be loaded to its proper capacity. The several step-down substations are located on the

outskirts of the field and are fed from a 33-kv. double-circuit transmission line which completely encircles the field. The most up-to-date relay protection has been applied to the 440-volt feeders.

In this country the problem is a different one, due to the rapid development of the industry. However, there is a marked tendency toward more conservative methods. In the Gulf Coast, Pacific Coast, and Mid-Continent fields various types of distribution systems have been used and there are many conflicting ideas as to which is the best. It is believed that there is no one type of system which will serve all fields with equal



Outdoor substation in a California oil field. The large number of transformers indicates that power requirements have grown considerably since the first installation.

economy, and a few examples will serve to illustrate these statements. In one particular area three systems are known to be in use and each has been planned to meet existing conditions.

One uses a 3-phase, 4-wire system transmitting at 4 kv, 2.3 kv. between each line and neutral. Transformers with a 2,300/440-volt ratio are used throughout the field as a standard and installed in whatever size of bank necessary. A separate lighting circuit also is carried on the same poles. In the second case, a 2.3-kv., 3-phase, 3-wire system is used and the main feeders of this voltage have a maximum length of 4,000 ft. Transformer banks consist of three 25-kva. single-phase 2,300/440-volt transformers. The 440-volt secondary feeders are not over 1,200 ft. in length, supplying power to only two wells from each bank. The third case is unusual in that all the power is distributed at 440 volts, the distribution feeders are of very large size and feed from 450-kva. transformer banks. Each feeder supplies a comparatively large number of wells and extends a maximum distance of one mile from the bank.

Of the three it would seem at first thought that the third case is the most uneconomical. However, it readily can be appreciated that there is a great saving in small distribution transformers for field use and in other apparatus such as lighting arresters, switches and insulators.

Due to the fact that the single-phase load in the average oil-field is comparatively small it is not fully understood why the 3-phase, 4-wire system is used. This type of system is used extensively in industrial communities that require large amounts of both 3-phase and single-phase power which in many cases must be transmitted over a relatively large area. However, in view of the fact that oil field single-phase load is very light in most cases, it would seem inadvisable further to complicate the system with a fourth wire. Standard rig-lighting transformers of suitable voltage rating for connection direct to 440-volt supply may be obtained easily and the load as such is not sufficient to cause excessive phase unbalance.

As pointed out before, the main substations which reduce the transmission voltage to a value suitable for distribution purposes generally are erected by the power company and usually are of the outdoor wood-pole type although steel structures make a more permanent installation. The type of such a station, if it be of reliable construction, is of little consequence to the customer although he should approve such points as capacity, voltages, protective and metering equipment as provided by the power company. Station location should be determined by carefully considering the present and predicted future load centers and other possible sources of power consumption such as pipe-line pumping stations, refineries, compressor plants and oil camps.

Two general procedures can be followed in designing and laying out the individual distribution transformer banks. First, 300 to 450-kva. banks of single-phase units may be used supplying power at 440 volts to a number of wells, generally from 15 to 20. Second, a large number of smaller banks may be used to supply from two to five wells. The average size would range from 75 kva. to 150 kva. depending upon the size of motors used to drive pumps and the method of pumping. It may be seen that each of these methods has certain advantages and certain disadvantages.

Whether large or small, each bank should have ample protection. Pole-type lightning arresters and expulsion fuses should be installed on the high side. No protecting devices, or switches, are required on the low-voltage side. An exception to this last statement would be in the case where 440-volts is used for distribution and where several feeders extended from each larger bank. Then it would be advisable to provide a circuit breaker and over-load protection on each feeder in addition to the protective equipment on the high-voltage side of the bank.

The first-mentioned scheme has the advantage in that an appreciable saving is effected in transformer cost, lightning arresters, high-voltage fuses and insulators. However, if the wells are widely separated the increased cost of copper for the lower voltage easily might offset this saving. Any attempt to reduce conductor size would cause prohibitive voltage drops and power losses, especially during heavy operations at the well.

The second scheme has the advantage of flexibility, the desirability of which must be balanced against the greater initial cost, especially when very small transformer banks are used.

It is believed that where wells are not too widely separated, a bank of approximately 150-kva. will prove the most satisfactory because the cost installed would be less than for two 75-kva. banks and better voltage regulation would be obtained for pulling and cleaning out operations in which from four to eight times the usual amount of power is required. This advantage is offset partly by the fact that in the event of bank failure the curtailment of production would be greater than where 75-kva. or smaller banks were used.

In conclusion, it is believed that economies gained in operation and the reduction of initial cost fully warrant the added expense in making a systematic study of every oil field distribution system. Existing layouts can be improved and new ones properly handled on an engineering basis.

All the Comforts of Home

By Wallgren

It Wouldn't Happen in a Red Seal Home

The wife is talking: "You go in first, dear, and turn on the lights."

"Sorry, dear, I forgot I had the vacuum cleaner attached to that socket."

"Oh, my! I'm sorry. The battery charger is on that socket."

"No, not that one, dear. The sewing machine is on that switch.'

"Don't try the hall light—the electric heater is attached there."

"Oh, dear, I'm sorry! The percolator must be on that one."

"Watch out in the kitchen. I think the waffle iron's attached there."

"Careful! The electric flatiron is on in the laundry."

"And in the bedroom you'll have to watch for my vibrator and curling iron."

"I think you left your electric hot-water heater attached in the bathroom."

After some moments: "What's the matter, dear? Can't you find a light?"

He: "Now, durn it, try to run something with that!"

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Let the Public Know the Why and How of Regulation*

By H. H. Corey
Oregon Public Service Commission, Salem, Oregon

MR. COREY, who has had sixteen years' experience in public utility regulation herein advances some of the benefits of state regulation, and points out the responsibility for informing the public of these benefits so that the system may continue.

THE RELATION of public utilities to the regulatory bodies is such that a concerted effort must be made to sell to the public the fact that regulation of natural monopolies has been adopted by both federal and state government for the general public good. There has never been a time when the public so much needed to know the facts upon which regulation is based than since the general increase in the cost of living during and since the war.

No one likes to pay more for what he buys, and there is something in human nature that makes us resent, particularly, advances in the charges for public serivce. The average consumer is prone to criticize a ten, twenty or thirty per cent increase in railroad, electric, gas, or telephone rates and accept cheerfully from fifty to one hundred and fifty per cent increase in clothing, shoes, picture shows, ice cream, haircuts and shaves; and even the old satisfying five-cent cigar was given up without public resentment. Yet, I believe that in the vast majority of instances, the public, when properly advised through the press, is inclined to be fair and just in its judgment concerning public utility matters.

Times are changing. The abuses of the past that applied particularly to public utility operations have been eliminated. The press knows this and for the most part will present the facts fairly to its readers. The daily press is the means by which the people of a democracy, such as ours, must depend for enlightenment on all public matters and no reputable newspaper will knowingly disseminate propaganda detrimental to the general public welfare.

Facts of Regulation Should be Broadcast

There is, it seems to me, an important duty resting upon the utilities and the public service commission which regulates them to see that the people are informed concerning the facts of regulation. I believe that utilities, through newspaper advertising, addresses before civic bodies, by pamphlets mailed with bills, and in other ways, should keep their customers informed concerning what it takes to render the constant and efficient service they give, what is done to make the customer happy and comfortable, and particularly when the occasion arises, to acquaint them with the need of the revised rate schedule in order that they may be enabled to continue that service. Information concerning a utility and its operations is an essential part of the public service and has been regularly upheld by the commissions and the courts as a proper and legitimate operating expense.

Possibly an equal duty rests upon the commission to inform the people of its activities and of the reasons for rate and service adjustments. It finds its efforts along this line, however, sometimes misconstrued. An attempt upon the part of the commission to furnish accurate information to the public concerning any matter that has aroused public interest will be considered by some to be an attempt to justify the commission's own actions in public matters. The commission tries to state fairly the facts and its conclusions in its orders in an accurate, dignified and unbiased manner; yet only a small portion of the general public ever reads these orders.

The utilities are, in fact, in far better position to enlighten the public as to rate and service regulation than is the commission.

Too Low a Rate Is Detrimental to Public

A rate increase, however well deserved by the utility and however demanded in the interest of continued efficient public service, is certain to be unpopular. Yet, I will venture the assertion that in most cases, through a properly informed press fortified by a continuous publicity policy of accurate information coupled with a sympathetic understanding of the newspaper's own problems, duties and responsibilities, necessary rate adjustments would be generally accepted and acquiesced in by the public.

During and since the war, conditions increasing the cost of production and preventing the growth of utility service to meet the increasing requirements of the public have developed. Public utilities had so direct a bearing on the development of the state that nothing could be allowed to interfere with adequate service. This has resulted in numerous applications for increase in rates to cover the increased costs of operation.

During the hearings on these applications the commission was compelled to consider the antipathy of the public to increased costs. It is no reflection on a man's judgment to say that he is averse to changing conditions. The majority of our citizens seem to be well satisfied with matters as they now are. This national attitude of the public was difficult for the commission to overcome. However, time has proved that the judgment of the commission in allowing increased rates was correct, for it can be shown clearly that too low a rate is just as unfair to the public as too high a rate. With too low a rate the public must suffer inadequate service, and the utility is compelled to pay a higher rate for money acquired from the money markets, which burden in turn must be borne by the patrons, since it ultimately means a further increase in rates.

* Extracts from an address delivered before the Engineering Section, Northwest Electric Light and Power Association, Portland, March 10-11, 1927.

Competition vs. Commission Regulation

Prior to commission regulation, competition served to regulate to a certain extent. However, unrestricted competition between public utilities did not prove to be a good thing. Whether or not it is beneficial depends upon the results which flow from it in each particular case. If just as good results can be secured by governmental regulation of an existing utility that has a natural monopoly, so that the rates and service enjoyed by the public are as good as they reasonably could be under normal competition, the consuming public has nothing to gain by competition. On the other hand, that portion of the public that invested its funds in the securities of the existing utility whose rights must also be considered, may have much to lose by competition. In a broader sense, therefore, a policy permitting indiscriminate competition can be extremely harmful to the state at large, since it would discourage investment in the development of new utilities in sections where there are no existing utilities of the same character, and where such utilities are imperatively demanded for the development of the state.

This aspect of the public utility question must not be confused with trust regulation, as it is by some persons who do not make the distinction between a natural monopoly, such as an electric light plant, for example, and an ordinary commercial trust. The proponents of the theory that trusts shall be controlled by competition, as well as those advocating control by regulation, all agree that better control of a natural monopoly can be had by adequate and efficient regulation than by unrestricted competition, because competition with a natural monopoly means wasteful duplication. While this theory is comparatively new, it is the basis of the policy of practically every state regulatory body in the Union.

State vs. Municipal Regulation

Public utility regulation has been given a thorough trial in every state in the Union with the exception of one, Delaware, and has not been found wanting. Yet in some instances municipal regulation of public utilities is advocated. In my opinion, municipal regulation would be too susceptible to local influences to afford fair, impartial and nondiscriminatory rates and service to the various communities. Many of the larger utilities serve several communities and if each should be allowed to regulate, chaos would result. There would be constant litigation before the courts on appeals from home-rule regulation, and new capital would hesitate to invest in securities of the present plants or to assist in financing new construction in localities that are not now served by public utilities.

My experience, covering sixteen years with public utility regulation, teaches me that regulation must be such as will encourage the construction of new utilities in many communities not now served, and to aid and encourage the present utilities to reach the maximum of efficiency in operation, which tends to produce a lower average price of the utilities' products to the public.

Municipal Operation Less Efficient

Municipal regulation, in my opinion, is not at all practicable or feasible and cannot possibly produce the best results for all concerned, since, as a general thing, utilities now managed and regulated by municipalities furnish poorer service than privately owned and operated utilities. They are on a lower level generally than the private corporations, and, as a rule, they are slow in responding to new discoveries and new methods and often fail to supervise their equipment, while discriminatory rates among them are as prevalent as was ever the case of private operation before regulation.

The low rates sometimes charged by municipal plants are not always due to low cost of production, but frequently are justified because upkeep and other costs are shifted from the consumer, as such, to the taxpayer, as such. Municipal plants are usually exceedingly backward in their methods of bookkeeping. Several state commissions regulate municipally owned as well as privately owned utilities. The Wisconsin commission's jurisdiction was extended so as to include municipally owned plants, and a thorough investigation of the accounting methods employed by the various utilities was made by that commission assisted by a corps of accountants from the university at Madison. Their investigations show that out of 177 municipally owned plants 164 failed to keep their accounts so as to reflect the true results of operation.

Furthermore, the theory of public operation cuts deeply to the heart of the American system of business and government. Our present political system has been brought about through an evolutionary process based on fundamental ideas which permeated our whole life and habits of thought. These fundamental ideas wisely contemplated that the development and conduct of our industries should be left to the initiative of private citizens, and our conception of the relation of government to business has been in the main the simple one that government existed merely to prevent the rights or activities of one man from encroaching upon the equal rights of another.

Complex Civilization Has Not Changed Theory of Government

The great increase in the functions of government which has come with the passage of time and with the increase of our population, has been merely the development of this theory of preventing the mutual encroachment of individual rights as those rights became more crowded and complex. Statistics show that a century and a quarter ago nine-tenths of the American people lived on farms. They built their own houses; they raised their own food; they made their own clothes; their homes were lighted by candles dipped by themselves; their water supply came from their own wells or springs, and they had very little need of government to protect these simple rights from encroachment by their neighbors. Now, the majority of our population lives in great cities and derives its water, its food, its clothing, its light and other means of livelihood from far distant supplies. The rights of individuals to live and enjoy free pursuit of their vocations are intertwined with the countless similar rights of a multitude of their fellow men living under similar conditions. For the protection of their interwoven rights we now have to depend upon governmental regulation to a far greater extent than did our great-grand-fathers. But the underlying principle of this regulation is precisely the same as it used to be, and we have made the life of our modern gigantic businesses as dependent upon individual independence and initiative as was the life of the frontier farmer a century ago.

Applied to public utilities, which is a business coming closely in contact with other men's rights, our methods have resulted in a system of private ownership and operation, giving full play to the initiative of the managers of the business, only checking that initiative with a quasi-judicial system of regulation by government, which acts usually through the agency of public service commissions, in order to see that the rights of the public are not infringed. Private operation has made America pre-eminent in public utility service.

Individuals Rewarded on Merit Basis

All privately owned public utilities begin with systematic engineering plans of construction work, and there arises the first economy in favor of private ownership. In organizing the staff to design and build, merit and efficiency alone are considered; political influences are not considered. Each man is selected and each move made to secure the largest, quickest and safest return for the money expended.

In private enterprises promises of reward for efficient service can be made and the incentive to active and successful effort can be maintained. Competent employees are recognized and rewarded, and promotion to positions of the greatest usefulness is sure and easy. Throughout the business world the best service is rendered when there is hope of reward and the best commodity is produced when there is hope of profit. Where the hope of reward and profit are lacking, service and commodity depreciate in value. The rewards of political life are dubious and profits are not forthcoming by honest means. All these things, I believe, go to make municipal ownership of public utilities undesirable.

The losses due to extravagance and misdirected efforts of municipal bodies represent enormous dividends on properly applied capital, and when it is considered that any municipal work can be built and operated at less cost by private corporations than by public corporations, it is a marvel how intelligent people can be hoodwinked into the support of the popular and irresponsible clamor for the conduct of public utilities by municipal officials. As a personal conviction, I think the less our municipalities engage in lines of business which can be conducted by private corporations, the better it is for the public at large.

State vs. Federal Regulation

Neither is there, in my opinion, any necessity for federal regulation of public utilities other than those over which the government has already assumed jurisdiction. With efficient state regulation, such as now exists throughout the United States, it is difficult to conceive why there should be any tendency toward centralizing regulation at Washington, D. C. Should there be such a tendency, it should be viewed with alarm, as long range regulation will never satisfy citizens residing in remote sections of the United States. Any relief to which they might be entitled would be very slow in materializing as a remote regulatory body cannot possess the complete, impartial understanding of local conditiions so essential to a just and equitable solution of local matters. The National Association of Railroad and Public Utility Commissioners has for years stood against undue extension of federal control over local matters. It is firmly believed by that body that state regulation must be preserved or we will create in Washington an overwhelming bureaucracy exercising a power never exercised before in the history of the world.

I am convinced, therefore, that a satisfactory condition prevails under the existing system as it pertains to private operation of utilities under state regulation. Let us recognize the extent to which the industry has developed under this system; let us understand the degree to which the public has been benefited by this development; let us realize that a continuation of the system depends on the public being adequately informed of that benefit; and then, let us assume the responsibility for disseminating this information, thus fulfilling more adequately our obligations both to the industry and the public which we represent.

Successful Accident Prevention*

By F. B. Lewis
Assistant General Manager, Southern California Edison Company, Los Angeles

STATISTICS often are misleading and yet in the compilation and study of statistics we often discover facts of importance which aid in making a decision as to correct and efficient operating procedure. Accident statistics is a comparatively new subject with many companies, but during the past few years some progress has been made in an effort to standardize data of this kind for the purpose of comparison and as a result there are now available some fairly reliable figures.

The National Safety Council, of which most large companies are members, has published a report for the years 1923, 1924 and 1925, in which are the first reliable data on the subject of frequency and severity of accidents as experienced by a representative group of public utility companies. From this data has been segregated those figures which apply to Pacific Coast companies and which show that their record for the years mentioned is not favorable in comparison with the average for all reporting companies. Unfortunately the Southern California Edison Company was not included among those whose statistics were reported to the National Safety Council. Comparable figures for that company for the year 1926 are shown in the accompanying table, however, and the comparison may be of interest.

* From a paper presented at the eleventh annual P.C.E.A. convention, Santa Cruz, Calif., June 14, 1927.

TABLE OF ACCIDENT STATISTICS

	Reporting Companies National Safety Council			So. Calif. Edison Co. 1926		
	1923	1924	1925	Const.	Oper.	Total
Total employees	60,721	76,217	85,200	2,768	4,370	7,138
Total fatal	102	133	152	6	8	14
Total lost time (excluding fatal)	6,248	8,408	8,162	496	256	752
Total days lost (excluding fatal)	84,458	106,446	95,215	15,725	3,889	19,614
Fatal per 1,000 Emp.						
Average all divisions	1.7	1.8	1.8	2.2	1.8	2.0
Aver. Pac. Coast Div.	4.0	4.8	4.6			
Lost Time per 100 Emp.						
Average all divisions	10.3	11.0	9.6	17.9	5.9	10.5
Aver. Pac. Coast Div.	11.8	16.5	14.6			
Days Lost per 100 Emp.						
Average all divisions	139	140	112	568	89	275
Aver. Pac. Coast Div.	188	223	199			

In acceding to the request to prepare this story there was no desire to show that the Edison company is superior to others on the Pacific Coast but rather to show that an improvement is possible and to indicate how this favorable showing has been achieved. The story may help to impress the fact that accident prevention work requires constant attention, but that it is well worth while.

Policy

There are several ways to attack the problem and inasmuch as the Edison method differs somewhat from that of other companies the salient features of that plan are described.

Some executives hire a safety engineer, see to the adoption of more or less elaborate safety rules and then

dismiss the subject from their minds, relying upon the safety engineer to formulate and carry out the plan. We do not believe this method will prove effective in the majority of cases. The safety engineer is, or is likely to become, a highly technical individual; his regulations, orders and decisions frequently meet with opposition from the man in the field who is considering the problem from a purely practical viewpoint; his actions often constitute a serious interference with the authority of the foreman and superintendent who are responsible for getting the work out. Our policy, when we come to analyze it, is to *put the responsibility directly up to the department head,* superintendents and foremen, holding them responsible for accident prevention as a part of their regular duties.

The plan contemplates the adoption of adequate but simple safety rules, the test of each rule being that it is not only a good safety measure but also that it is practical and enforceable. To this end we have just completed a revision of our "Book of Safety Rules and General Instructions" in an effort to get all of this information in concrete form where it will be available to all employees. These rules are issued to all station chiefs, superintendents and foremen and to all other employees engaged in hazardous occupations.

Safety Discipline

The most important part of the entire problem is what we call "safety discipline." My military friends tell me that there was considerable misunderstanding as to the word "discipline" during the World War. Many officers and soldiers thought that good discipline meant neat appearance, polished boots and a snappy salute, whereas in reality these things were only an indication of good discipline. Real discipline in the military game means the prompt and cheerful carrying out of all orders and, in the absence of orders, doing that thing which in your judgment would have been ordered under the circumstances; it means compliance with the spirit as well as the letter of an order. It is this meaning and understanding of discipline as applied to accident prevention work which we must instill in the minds of all of our employees if we are to make progress in the work of minimizing accidents. Good safety discipline in an organization means that every individual is constantly on the alert to reduce hazards and accomplish the work without injury to those who perform it.

To get this safety discipline on down the line to the employees on the job whom we are trying to protect, we have put the responsibility straight up to the foreman. We have told him that it is just as much a part of his job to see that the work is done safely as to see that it *is done within the time limit and within the cost estimate.* In this way there is no division of authority and a safety order carries just as much weight as any other order. A foreman in handling his crew should give just as much attention to safety appliances, protective devices and safety methods as he does to his other tools and plans for getting the work done efficiently.

We have a central accident prevention committee composed of responsible representatives of the principal departments of the company. In times past, this committee was concerned principally with the study of safety appliances, technical methods, etc. Within the past few years the committee has been reorganized and now devotes its time almost exclusively to the study of the human side of the equation. Departmental committees report to the central committee and so the story is carried down the line until we end up with an accident prevention committee in each power house, district, or construction camp. Reports from each committee are cleared through the next higher committee so that the work is co-ordinated to the end that the company's general policy may properly be interpreted and enforced.

To help keep the idea before the men who actually do the work we have organized, in the various branches of our operating department, employees' careful clubs the membership of which is composed of the superintendents, foremen, station chiefs, and responsible employees who have shown a satisfactory interest in this phase of the work. Each member of the careful club is issued a lapel button or pin to identify him as a member of the club. If, however, he should have an accident or someone in his gang suffers an accident the committee chairman takes the button away from the individual having the accident and also from the foreman under whom the individual was working and the buttons are not returned until the man has had no accidents over a period of 90 days or more. In addition to the careful club button a plaque similar in design to the button is provided for each generating station, substation, and each line truck, the crews of which show a record of no accidents over a period of 90 days. If an accident occurs the plaque is taken away from the crew and it must again be earned by them by a record of 90 days or more without accidents. It is surprising to see how most men treasure these emblems and to what extent this plan serves to stimulate interest.

Persistent Attention to Accident Prevention Work

The plan as described has served so far to maintain interest throughout the organization, with officials, superintendents and foremen completely in accord. We try to keep the work before the organization at all times and not to overlook an opportunity to tie-in accident prevention on every occasion. Our 31 districts have an efficiency cup, for which they compete each year, the cup being a handsome trophy which is awarded with suitable ceremony to the district which wins it for the year. The district's accident prevention record counts five points in connection with the awarding of this cup. We find that district managers and their employees thus are much more interested in accident prevention work, as it materially affects their showing in an effort to win this cup.

Our large steam plant at Long Beach has an efficiency cup awarded to its department which shows the greatest efficiency over a year's period. Again we saw an opportunity to work in accident prevention and hence the safety record of each department was made an important factor in the awarding of this cup. As a result of the interest now being shown in accident prevention work at the Long Beach steam plant, they are able to report the enviable record of having completed the first *five months' operation* of this year *with no lost-time accidents.*

Although we became interested in the subject of accident prevention from an humanitarian standpoint in order that we might make our jobs safe for our employees, we find that the expense of carrying on this work has been inconsequential and know that the amount of money saved to the employee and to the company through the prevention of accidents represents a handsome profit to all concerned.

Engineering Practice

New Switching and Distribution Center for Tacoma

Cushman Substation Serves as High-Tension Terminal as Well as Low-Tension Distributing Station

By A. F. DARLAND, Electrical Engineer and Superintendent of Electrical Construction, Cushman Power Project, Tacoma, Washington

CUSHMAN substation is the distributing terminal at the southern end of the two 110-kv. transmission lines from the Cushman plant. (See Electrical West, March, 1927, p. 133.) The substation occupies a tract 260x320 ft. on the outskirts of a residential district of Tacoma and serves both as a high-voltage transformer and switching station and as a low-tension distribution station. The station was designed and built to accommodate the ultimate power output of the Cushman development, a total of 108,000 kva.

The present out-door equipment consists of a single 110-kv. bus, two 110-kv. G.E. line circuit breakers, two 110-kv. lightning arresters, a 42,300 kva., 110/50-kv. bank of Allis-Chalmers transformers supplying double 50-kv. buses, two outgoing 50-kv. lines and two 10,000-kva., 50/13.2-kv. banks of Allis-Chalmers transformers connected to each 50-kv. bus through 73-kv. G.E. circuit breakers. The outgoing 50-kv. lines have lightning arrester protection. A reinforced concrete building 75 x 135 ft. in plan, built at one corner of the grounds, houses a 15,000-kva. Allis-Chalmers synchronous condenser and double 13.2-kv. buses, and provides space for the control room, battery room, shop and storage room.

Both the 110-kv. and the 73-kv. oil circuit breakers have the same rupturing capacity, 1,000,000 kva. Each unit of the 42,300-kva. bank of transformers has three windings: 12,000 kva. at 105 kv., 14,100 kva. at 50 kv., and 5,000 kva. at 13.2 kv. These windings are connected respectively, star, star, and delta. Only the primary neutral is grounded at the present time. The tertiary windings are connected to the synchronous condenser, using a 3.3 kv. tap on the 13.2-kv. winding for starting purposes. One spare transformer is in reserve for this bank.

Leads from these two 10,000 transformer banks traverse a tunnel to the 13.2-kv. distribution buses located in the building. Bare copper bus bars supported on pillar-type insulators are carried along the side walls of the tunnels, each phase separated from adjoining phases by concrete barriers. Asbestos-board covers are used on the open sides of the bus structures. The tertiary leads from the main transformer bank are carried through the tunnel in similar manner and thence to the condenser starting and running switches located on the second floor of the building.

On the first floor in the north half of the substation building are the two 13.2-kv. buses. Twelve truck-type FH203 switches constitute the initial installation which provides for three outgoing feeders, the station service feeders and the two transformer banks supplying the buses. Each outgoing feeder is carried underground from the basement of the station to poles in the streets adjoining the station property. For each of these underground runs two 250,000-circ-mil., 3-conductor, paper-insulated, lead-covered cables are used.

Occupying the south half of the building, and of sufficient size to accommodate the installation of three machines, is the condenser room. The one 15,000,-kva., 720-r.p.m, 13.2-kv. condenser now installed is sufficient for the present to effect proper voltage regulation of the transmission lines.

The control room is located on the second floor in the corner of the building overlooking the outdoor equipment and adjoining the condenser room, from which it is separated by a glass partition. Thus the operator has full view of practically all equipment. The battery room, carrier current telephone equipment room, and a large store room occupy the third floor of the building.

A 50-ton Whiting crane in the condenser room provides handling facilities for heavy parts and equipment. Transformers are brought into one end of the condenser room for repairs which necessitates the use of the crane. A 5-ton elevator is installed in the north side of the building serving the shop located on the second floor and the store room and has proved to be a valuable piece of equipment.

A 250-watt Westinghouse carrier current telephone equipment is installed for communication between the power house and substation. Aside from a commercial telephone toll line the carrier system is the only communication available to the power house. A way station recently was placed in service at a small substation at Henderson Bay and a portable set suitable for mounting on a small truck is available for emeregncy set-up along the transmission line. Coupling to the transmission lines at the terminal and way stations is effected by approximately 1,500 ft. of antenna. The antenna for the portable set, 1,000 ft., is carried on a reel with the equipment. The telephone equipment is fully automatic. Calls between the various stations are handled in a similar manner to that by which ordinary automatic telephone calls are handled.

Scheme to Relieve Congestion of Stores Department

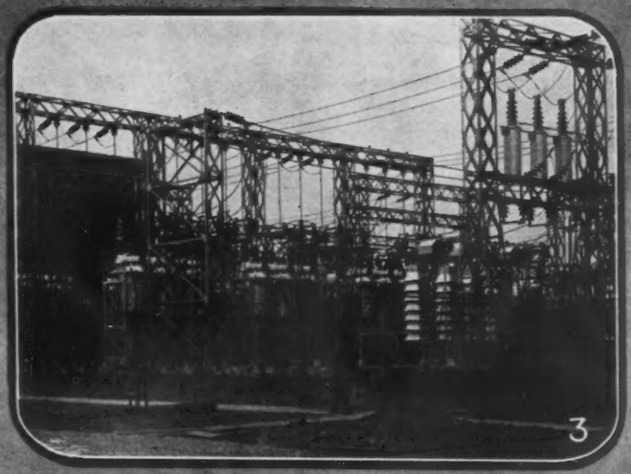
Usually there is congestion and confusion around the storekeeper's office every morning while the various line crews collect the material for their day's jobs. Not uncommonly there are four or five different men waiting to be served at the same time, resulting in a loss of time.

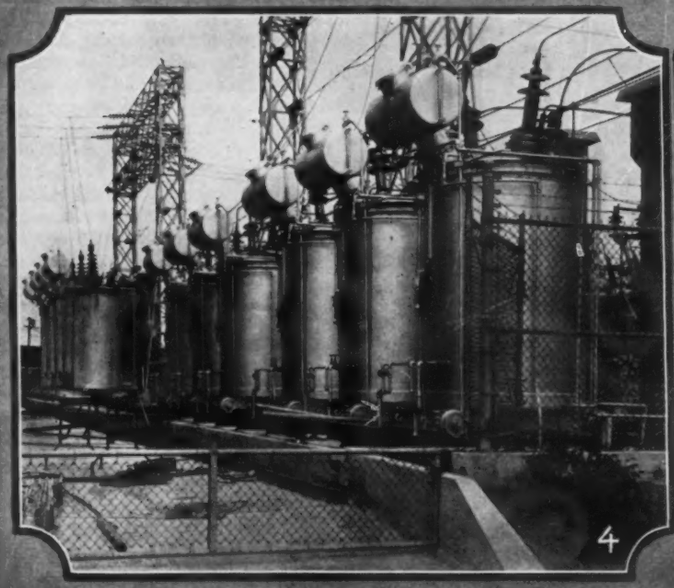
According to common practice the line crew foreman goes to his order box in the office of the electrical superintendent each morning and gets his job orders, that have been placed there the day before, and proceeds to the storeroom to gather required material and to replenish his truck stock. With several different crews following this same procedure a heavy peak load is thrown upon the store department as mentioned. The morning's confusion and the time delay can be obviated if the procedure be so arranged that each line foreman will go to his order box in the evening upon return from the day's work, check his next day's orders, and place his stock material requisitions with the storekeeper that same evening. When this is done the night man or night crew, as the case may be, in the store department may collect the material that each foreman needs more at leisure and have it already assembled by morning.

A second item that will help to relieve the morning congestion is to have a material box for each line crew in which the storekeeper can assemble the material required by the various jobs as they come up each day and in which also might be placed the stock material collected during the night shift. Then all that is necessary in the morning is for the crew foreman to go to his box and get his material without any congestion or delay. This scheme was suggested by A. A. Ashlock of the San Diego Consolidated Gas & Electric Company.

Cushman Substation

The City of Tacoma's newly completed transmission terminal and distribution substation is shown in the accompanying views. (1) Condenser room and 15,000-kva. synchronous condenser. (2) Exterior of building and corner of ourdoor bus structure. (3) Bus and switching structure showing the arrangement of oil circuit breakers, lightning arresters and high-tension instrument transformers. (4) Looking down the transformer bay, 50/13.2 kv. in the foreground and 110/50 kv. in the background. (5) Indoor bus and switch aisle for the 13.2-kv. distribution showing truck-type breakers and constant-current regulating transformers for the street lighting circuits.





Analysis of Current Transformer Tests—V

The "Why" of Some Basic Facts

By E. C. GOODALE, Tacoma, Washington

Perhaps the most common as well as the simplest current transformer connection is the one in which a current transformer is installed in each of the three legs of a 3-phase line. The connection diagram of Fig. 20 shows a typical installation and its accompanying vector diagram indicates the phase relations of the various quantities involved. It is evident that the currents flowing through the relays and ammeters in each case are directly proportionate to the currents in line conductors, reduced according to the current transformer ratio.

In previous discussions the line currents have been assumed as bearing a 30-deg. phase relationship with their (vectorially) nearest line voltages, as illustrated in Fig. 20 vector diagram. The following discussion will show why this is true.

Phase Angle Discussion

With a 100-volt balanced 3-phase circuit such as shown in Fig. 21(A) the three voltages, when plotted vectorially in a heel-and-toe order, must form a closed diagram such as triangle ABC in Fig. 21(B).

This is true of any number of conductors in any a.c. system upon which are impressed pure (fundamental) sine waves of a fixed frequency. In 3-phase 3-wire systems the phase relations are fixed when the values of the three line voltages BA, CB and AC are determined, as by voltmeter readings, since the closed figure will be a triangle which cannot change shape without changing the lengths of its sides. For more than three conductors it would be necessary to form triangles from three readings at a time, assembling the triangles together by making one reading common to two triangles in each case until the figure be completed.

After completing the triangle ABC from the readings BA, CB and AC the vectors forming it are plotted with their heels all at a common point to show the phase angles between them. [Fig. 21(C).] In changing from the vector polygon of Fig. 21(B) to the vector radial diagram of Fig. 21(C) the vectors are kept at their original slopes or angles with reference to the margin of the paper on which they were drawn. Vectors may be moved from one position to another without changing their values as long as their lengths and directions with respect to a fixed reference line remain unchanged.

Induced source voltages under consideration [Fig. 21(A)] are assumed to be 100 volts from B to A; 100 volts from C to B; and 100 volts from A to C. Hence, if a 577-watt lamp is placed across each phase as shown a current of 5.77 amp. will flow through each lamp in the directions indicated in Fig. 21(A) at the same instant that the corresponding source voltages are at a maximum, as indicated by the voltage arrows. Lamps are non-inductive and therefore draw currents in phase with applied voltages. Pressure E_{BA} will tend to force a current I_F down line A, through lamp F and back through line B to the source, as shown by the dotted arrows. Pressure E_{CB} will tend to force a current I_G down line B, through lamp G and back line C to the source. Pressure E_{AC} will tend to force a current I_H down line C, through lamp H and back line A to the source. Of course the current is not flowing in the indicated directions in all the lines at the same time. The arrows show the directions under consideration and the vector diagram of Fig. 21(C) shows when the currents flow in those directions.

In Fig. 21(A) it is evident that in order to complete the individual lamp circuits two directions would have to be assumed in each of the line conductors. This is manifestly inconvenient and hence it is better to disregard the individual circuit directions and just assume the currents as flowing from the source to the lead in all three line conductors.

Evidently:

$I_A = I_F - I_H$ (vectorially).
$I_B = I_G - I_F$ (vectorially).
$I_C = I_H - I_G$ (vectorially).

This agrees also with the application of Kirchoff's current law that any current entering a junction point will (vectorially) equal the current leaving, minus any other current entering. Junction points for the three equations above are A_A, B_B, and C_C respectively.

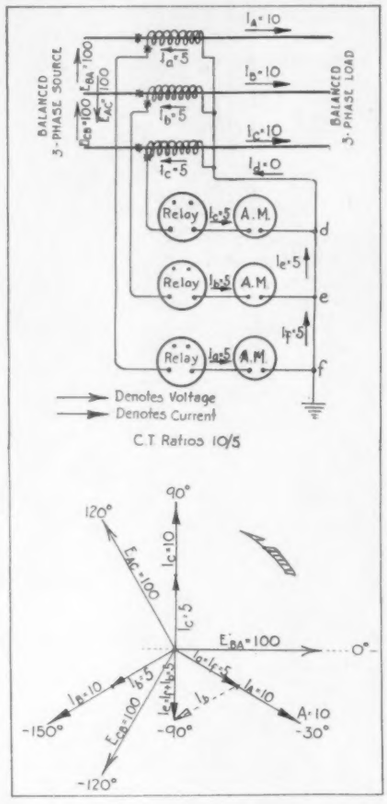


Fig. 20. Circuit diagram of common application of current transformers and vetor diagram indicating phase sequence of currents and voltages involved.

Since the vector sum of the left-hand members of the above equations must equal the vector sum of the right-hand members, then (vectorially):

$$I_A + I_B + I_C = I_F - I_H + I_G - I_F + I_H - I_G = 0.$$

Figure 21(D) shows the graphical summation of the phase currents to produce the line currents. It is to be noted that in subtracting vectorial quantities all that is necessary is to reverse the direction and add (vectorially) in a heel-and-toe manner, the resultant being from the starting point to the finishing point. It will be found by scaling the line-current vectors of Fig. 21(D) that they are numerically equal to 1.732 times the phase-current vectors, $1.732 \times 5.77 = 10$ amp. Transferring these vectors back to the radial diagram of Fig. 21(C) it is evident that they also bear 120-deg. relations with one another. That is, at intervals of 120 deg. or ⅓ cycle each in turn will be flowing from the source to the load at a maximum. Fig. 21(E) shows graphically that $I_A + I_B + I_C$ vectorially equals zero.

It may here be mentioned that in any electrical system made up of any number of conductors upon which are impressed pure (fundamental) sine waves of a fixed frequency the vector-sum of all the currents, considered as flowing from the source to the load, will be equal to zero regardless of the number of conductors, of the source voltages or phase relations, or of the load impedances or power factors. This means that when the voltage vectors are arranged in a heel-and-toe order they will form a closed polygon. If current transformer secondary coils be considered as sources and the instruments as loads, and if currents all are assumed to be flowing from the source to the load, then the vector-sum of the currents in all the secondary conductors (including the common ground conductor when one is used) will be equal to zero.

From the foregoing it is evident that if three equal non-inductive resistance loads, F, G and H, are connected in delta (Fig. 21) across a 3-phase 3-wire line the phase (load) currents will be in phase with their respective line-to-line (load) voltages; that the line currents resulting in supplying these phase (load) currents will be equal and 120 deg. apart with respect to each other but each at an angle of 30 deg. to one line voltage, 90 deg. to the second, and 150 deg. to the third. It is commonly said that the line currents are 30 deg. out of phase with the line voltages at unity power factor. This simply means that they are 30 deg. away from the (vectorially) nearest line voltage for unity power factor and balanced load. Actually a line current should not be assigned to any one line voltage since each current bears as much actual relationship with the line voltage 150 deg. away as with the one 30 deg. away.

Phase relations identical to those discussed above exist between the line voltages and line currents in a balanced star-connected 3-phase system with balanced pure resistance loads.

Determination of Phase Sequence

To determine the phase sequence or, as it commonly is called, the "phase rotation," perhaps the simplest device for voltages up to 440 is the commonly

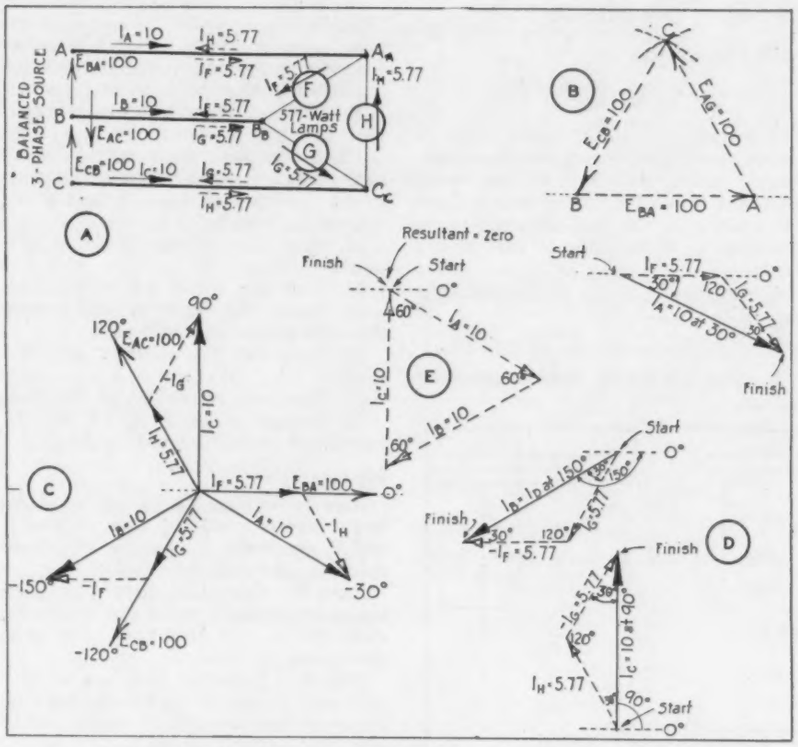


Fig. 21. Circuit and vector diagrams showing phase relations between various load and line currents and voltages for unity power factor and balanced conditions.

used one shown in Fig. 22. This consists of two equal 220-volt lamps and a 220-volt watthour meter potential coil connected Y. Call the three conductors the phase of which is to be determined A, B and C in any order desired. Then connect the three indicator leads, AA, BB and CC to A, B and C respectively, BB being the lead to the coil. If the AA lamp burns brighter than the BB lamp, then the phase sequence is A, B, C. That is, if a balanced load were to be connected to conductors A, B and C, the current flowing down line A to this load would be 120 deg. ahead of the current flowing down line B to the load and B current in turn would be 120 deg. ahead of the current in line C feeding the load. As regards induced source voltages the pressure built up in the source from B to A would be 120 deg. ahead of that from C to B and the latter in turn 120 deg. ahead of that from A to C. Referring to Fig. 21(C) the phase rotation would be cunterclockwise. If the CC lamp burned the brighter it would indicate that C was the "leading phase" and the phase rotation would be clockwise and the phase sequence C, B, A.

When testing a 440-volt circuit for phase rotation with 220-volt lamps they should be used for very short intervals only as there will be about 300 volts across one of the lamps.

Actual Test Results

For purposes of comparison with the theoretical phase relations of the preceding discussion data obtained from a laboratory test is given in Table IV and a vector diagram of this same data is shown in Fig. 23. The load consisted of three 250-watt lamps in parallel across each phase and current transformer ratios were 10/5. Methods of procedure were identical with those described in detail in Part II (Electrical West, April, 1927, page 210) and used also in Parts III and IV.

The test was repeated using unbalanced loads consisting of one 250-watt lamp across phase BA, two across phase CB and three across phase AC. Currents then were:

Primary currents:
$I_A = 7.7$ at 49-deg. lag.
$I_B = 6.0$ at 141-deg. lag.
$I_C = 9.4$ at 93-deg. lead.

Secondary currents:
$I_a = 3.9$ at 49-deg. lag.
$I_b = 3.1$ at 144-deg. lag.
$I_c = 4.8$ at 91-deg. lead.

Secondary tap or combination currents:
$I_d = 0$.
$I_e = 4.8$ at 88-deg. lag.
$I_f = 3.9$ at 4.9-deg. lag.

It may be noted that (vectorially $I_f = I_a$, that (vectorially) $I_e = I_a + I_b$, also that the current in the common wire $I_d = 0$. No current could be made to flow in this common wire even though each of the primary line wires in turn was temporarily disconnected from the source. This was due to the fact that the current in this common return wire must (vectorially) equal the sum of the currents $I_a + I_b + I_c$ which in turn must equal zero since in the primary the vector-sum $I_A + I_B + I_C = 0$. When one of the primary line wires was opened one of the remaining wires carried a single-phase current down to the load and the other carried it back, in a negative direction, and hence their sum also equaled zero. Had this been a 3-phase 4-wire connection it would have been found that the current in wire d would have been directly proportionate in value and equal in phase to the current in the neutral of the primary line, the current transformers controlling the actual metered value.

TABLE IV—TEST DATA.

	Volts or Amp.		Watts-Switch Down		Cosine of Angle	Angle (Deg.)	Registration-Switch Up	Lag or Lead
E_{BA}	114.0	+	1,140	+	1.0	0	Slight change	In phase
E_{CB}	112.0	—	530	—	0.472	118	Increased Neg.	Lag
E_{AC}	113.0	—	590	—	0.522	121	Decreased Neg.	Lead
I_A	10.8	+	1,030	+	0.835	33	Increased Pos.	Lag
I_B	11.0	—	1,120	—	0.89	153	Decreased Neg.	Lag
I_C	10.8	+	100	+	0.085	85	Slight Neg.	Lead
I_a	5.5	+	515	+	0.822	35	Increased Pos.	Lag
I_b	5.6	—	575	—	0.90	154	Decreased Neg.	Lag
I_c	5.5	+	60	+	0.096	85	Slight Neg.	Lead
I_d	0.0		0					
I_e	5.5	—	60	—	0.096	95	Slight Pos.	Lag
I_f	5.5	+	515	+	0.822	35	Increased Pos.	Lag

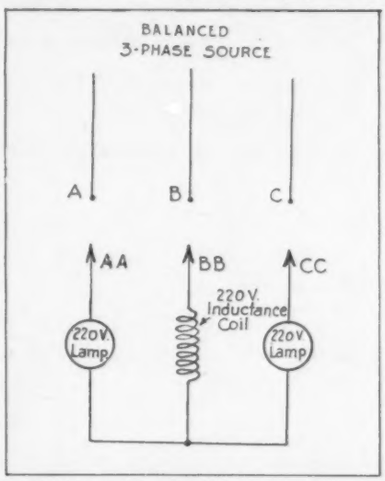


Fig. 22. Schematic diagram of circuit phasing equipment.

EDITOR'S NOTE: This is the fifth of a series of articles prepared by Mr. Goodale and built around actual tests of various current transformer connections as made in the meter testing laboratory of the Syracuse Lighting Company, Syracuse, N. Y. The next article will deal with a connection scheme for doubling the secondary current.

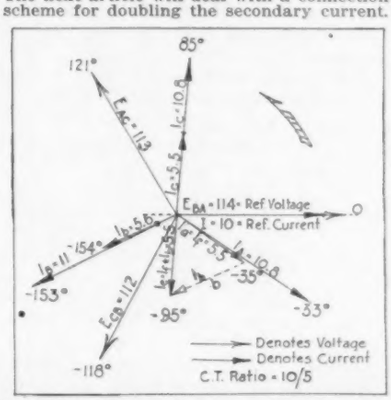


Fig. 23. Vector diagram showing phase relations of values given in Table III.

Connection Checks for Polyphase Watthour Meters—III

By D. T. Canfield, Instructor in Electrical Engineering, Purdue University, Lafayette, Ind.

CHECK NO. 6

The Jones Check

Special Apparatus: (1) A 25-watt lamp. (2) A stop watch. (3) Figs. 10 and 11. (4) Tables 1, 2 and 3.

Procedure, steps in proper order:

1. Be sure that the load is approximately balanced.

2. So connect the current leads to their respective current coils as to obtain forward rotation for the meter as a whole.

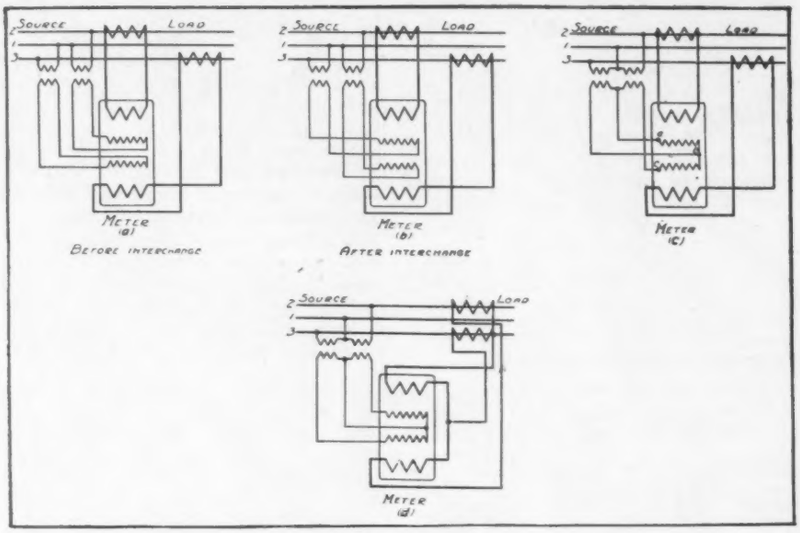


Fig. 8.—Illustrataion of Check No. 6.

3. If less than 8 leads are brought into the meter one or more of them will be common leads to both elements, current or voltage as the case may be. This may result in such connections as (c) and (d) of Fig. 8 if the wrong wire should be chosen for the common potential or common current lead. These connections must be eliminated.

For the case of Fig. 8 (c) the simplest method is to place the 25-watt lamp first from **a** to **b** and then **c** to **b**. If it burns with the same brilliancy in both cases lead **b** is the correct common lead. If in one case the lamp is very much brighter than in the other the wrong lead was assumed to be common.

For a case such as is shown in Fig. 8 (d) short each meter-element current coil in turn and if the meter stops in either case the wrong lead was assumed to be common. If the meter does not stop while either coil is short circuited then the lead assumed to be common to both coils is the proper lead.

4. Open the bottom element potential circuit.

5. Time one revolution of the disc.

6. Close the bottom element potential circuit.

7. Open the top element potential circuit.

8. Time one revolution of the disc.

9. Interchange potential leads. That is, put those leads that were on the top element on the bottom and those that were on the bottom on the top. [See Fig. 8 (a) and (b)].

Note: Care must be exercised at this point not to inadvertently assume the wrong common lead again. If there is any doubt repeat Step 3.

10. Open the bottom element potential circuit.

11. Time one revolution of the disc.

12. Close the bottom element potential circuit.

13. Open the top element potential circuit.

14. Time one revolution of the disc.

15. If Steps 5 and 8 are approximately equal insert the lamp in series with the top potential element with the leads left as they were after Step 9.

16. If Steps 11 and 14 are the ones that are approximately equal change the potential leads back to their original positions before Step 9 and then insert the lamp in series with the top potential element.

17. Open the bottom potential element.

18. Time one revolution of the disc.

19. Insert the lamp in series with the bottom potential element.

20. Open the top element potential circuit.

21. Time one revolution of the disc.

22. Change Steps 5, 8, 11, 14, 18 and 21 to revolutions per minute.

Interpretation:

Rule 1. In Step 22 one set of values, either those resulting from Steps 5 and 8, or Steps 11 and 14, will give speeds approximately equal.

Rule 2. Take that pair which are not approximately equal and divide the slow one by the fast one. This will give ratio A, Table 2.

Rule 3. Take the fast one of this pair and divide it by the average of the pair that are nearly equal. This will give ratio B, Table 2.

Rule 4. From these values of the ratios A and B determine the combination which contains such a pair of ratios and the nearest value of the angle θ. Using Table 2.

Rule 5. Make a table of five columns headed as shown in Fig. 9.

Rule 6. Having determined the combination by Rule 4, obtain the groups from Table 3 and trace them in their proper order in column 3 above.

Rule 7. With the value of θ as found in Rule 4 and Fig. 11 determine the power factor for each zone and place it in the right order in column 4 above.

Rule 8. By the use of Table 1 (unlike speed-values) place in column 5 above, the angle expressions for the groups in column 3.

Rule 9. By the speeds found in Step 22 resulting from Steps 18 and 21 we can determine the effect of decreasing the power factor upon the speeds of the fast and slow elements—that is, whether they speed up or slow down.

Rule 10. Taking this effect to Fig. 10, together with the angle expressions in the table of Rule 5, and remembering that the fast element always has the highest value of the cosine and

Table I.—Possible Groups for Check No. 6.

	If the speeds of the two meter elements are different	If the speeds of the two meter elements are approximately equal
Group 1	Only correct grouping $E_{12}\ I_2 \cos(30+\Theta)$ $-E_{21}\ I_2 \cos(30-\Theta)$	$E_{21}\ I_2 \cos(90-\Theta)$ $E_{12}\ I_2 \cos(90-\Theta)$
Group 2	$-E_{23}\ I_2 \cos(30-\Theta)$ $E_{12}\ I_2 \cos(90-\Theta)$	$E_{12}\ I_2 \cos(30+\Theta)$ $E_{23}\ I_2 \cos(30+\Theta)$
Group 3	$E_{21}\ I_2 \cos(90-\Theta)$ $E_{23}\ I_2 \cos(30+\Theta)$	$-E_{23}\ I_2 \cos(30-\Theta)$ $-E_{21}\ I_2 \cos(30-\Theta)$

Table II.—Possible Combinations for Check No. 6.

Combination	Combination I		Combination II		Combination III		Angle
Ratio	A	B	A	B	A	B	Θ
	.000	1.00	1.000	∞	0.000	1.000	0
	.058	1.06	0.942	7.00	0.062	0.942	3
	.114	1.13	0.885	8.77	0.129	0.885	6
	.167	1.20	0.832	5.99	0.202	0.832	9
	.219	1.28	0.781	4.57	0.280	0.781	12
	.268	1.37	0.732	3.73	0.366	0.732	15
	.326	1.46	0.684	3.07	0.462	0.684	18
	.362	1.57	0.636	2.76	0.570	0.636	21
	.410	1.69	0.592	2.44	0.692	0.592	24
	.454	1.81	0.545	2.20	0.833	0.545	27
	.500	2.00	0.500	2.00	1.000	0.500	30

that the angle θ increases as the power factor decreases, determine which of the two group 1's will satisfy this effect. Repeat for the group 2's and 3's. (See examples discussed later on.)

Rule 11. Discard all those not applying.

Rule 12. To distinguish between the remaining possibilities (in general three), use must be made of the tester's knowledge of local load conditions. (See examples following.)

Rule 13. Having decided which of the three in Rule 12 meets local conditions, use Table 1 and the fact that for power factors below 50 per cent the slow element should tend to rotate backwards, and for power factors above 50 per cent, it should rotate forward, while in both cases the fast element should rotate forward, to make the necessary corrections.

1 No.	2 Zones	3 Groups	4 Power Factors	5 Angle expressions for cosine values
1	A 1			
2	A 2			
3	A 3			
4	B 3			
5	B 2			
6	B 1			

Fig. 9.—Style of form for Rule 5.

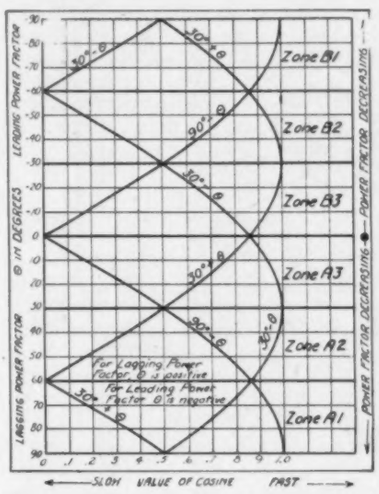


Fig. 10.—Curves for use with Check No. 6.

Advantages:

1. Absolutely no knowledge of the Class of meter or its connections is necessary.
2. Therefore no lead tracing is required.

Disadvantages:

1. This check is somewhat complicated.
2. Special charts and apparatus are required.
3. Some knowledge of the power factor is essential.
4. A balanced load is necessary.
5. Some difficulty may be experienced in differentiating between the fast and slow elements at power factors near unity.

The following examples will help to illustrate Check No. 6:

Example 1

In a certain meter installation—

Step 5 gave 19 sec.
Step 8 gave 17 sec.
Step 11 gave 24 sec.
Step 14 gave 49 sec.

Since Steps 5 and 8 are approximately equal, Step 15 applies, and

Step 18 gave 33 sec.
Step 21 gave 32 sec.

Step 22 gives the following:

From Step 5, Top element before interchange

$$= \frac{60}{19} = 3.16 \text{ R.P.M.}$$

From Step 8, Bottom element before interchange

$$= \frac{60}{17} = 3.53 \text{ R.P.M.}$$

From Step 11, Top element after interchange

$$= \frac{60}{24} = 2.50 \text{ R.P.M.}$$

From Step 14, Bottom element after interchange

$$= \frac{60}{49} = 1.22 \text{ R.P.M.}$$

From Step 18, Top element with lamp

$$= \frac{60}{33} = 1.82 \text{ R.P.M.}$$

From Step 21, Bottom element with lamp

$$= \frac{60}{32} = 1.88 \text{ R.P.M.}$$

As stated in Rule 1 Steps 5 and 8 are found to be approximately equal. Therefore according to Rule 2 take the values resulting from Steps 11 and 14.

$$\text{This gives ratio A} = \frac{1.22}{2.5} = 0.49$$

Applying Rule 3 the average of Steps 5 and 8 is found as follows:

$3.16 + 3.53 = 6.69$. $\quad \text{Av.} = \frac{6.69}{2} = 3.34$

$$\text{Therefore ratio B} = \frac{2.5}{3.34} = 0.75$$

Applying Rule 4, it is apparent from Table 2 that the only combination that contains such a pair of ratios is Combination III at about 19 deg.

Applying Rule 5, draw up the table shown in Fig. 12.

Table III.—Zone Groupings for Check No. 6.

Combination I	Combination II	Combination III	Zone
Group 3	Group 2	Group 1	A 1
" 1	" 2	" 3	A 2
" 2	" 1	" 3	A 3
" 3	" 1	" 1	B 3
" 1	" 3	" 2	B 2
" 2	" 3	" 2	B 1

Applying Rule 6, by taking Combination III to Table 3, column 3, Fig. 12 is obtained.

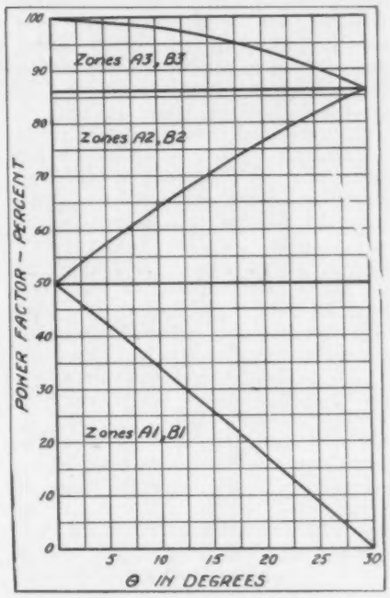


Fig. 11.—Curves for use with Check No. 6.

Applying Rule 7, by taking $\theta = 19$ deg. to Fig. 11 and from the curves obtain the power factor possible for each zone. These are arranged in column 4, Fig. 12.

1 No.	2 Zones	3 Groups	4 Power Factor	5 Angle Expressions for cosine values
1	A 1	1	20%	$(30+\theta)$, $(30-\theta)$
2	A 2	3	73%	$(90-\theta)$, $(30+\theta)$
3	A 3	3	95%	$(90-\theta)$, $(30+\theta)$
4	B 3	1	95%	$(30+\theta)$, $(30-\theta)$
5	B 2	2	73%	$(30-\theta)$, $(90-\theta)$
6	B 1	2	20%	$(30-\theta)$, $(90-\theta)$

Fig. 12.—Form of Fig. 9 applied to Example 1.

Applying Rule 8, by taking column 3, Fig. 12, to the first column of Table 1 the angle expressions for column 5, Fig. 12, are obtained.

Applying Rule 9, it may be noted from the speeds given in Step 22 from

the values of Steps 18 and 21 that 1.82 is slower than 2.5 and that 1.88 is faster than 1.22. Therefore the effect of **decreasing** the power factor is to slow down the fast element and speed up the slow element.

Rules 10 and 11. From the table in Rule 5 it obviously is necessary first to distinguish between group 1 in zone A 1 and group 1 in zone B 3; then between groups 3 in zone A 2 and group 3 in zone A 3; and finally between group 2 in zone B 2 and group 2 in zone B 1. Taking the first pair it is apparent from column 5 of the table, Fig. 12, that the angle expressions for group 1 are $(30+\theta)$ and $(30-\theta)$. Turning to Fig. 10 it is obvious that the curve $(30-\theta)$ has a higher value for its cosine in zone A 1 than does the curve $(30+\theta)$, but in zone B 3 the opposite is the case. Thus in zone A 1 the fast element corresponds to the expression $(30-\theta)$, but in zone B 3 the fast element corresponds to $(30+\theta)$. In zone A 1 the fast-element curve slows down as the power-factor angle increases from 60 to 90 (power factor decreasing) while the slow-element curve corresponding to the expression $(30+\theta)$ speeds up in zone A 1. This satisfies the effect found in Rule 9. In zone B 3 just the opposite is found to take place. The fast-element curve which now corresponds to $(30+\theta)$ speeds up as the angle changes from 0 to —30 and the slow-element curve corresponding to the expression $(30-\theta)$ slows down. It is obvious that this is just opposite to the effect found in Rule 9. Therefore the zone B 3 possibility may safely be discarded in favor of the zone A 1. In like manner proceed with the second pair, group 3 in zones A 2 and A 3, and find that the fast-element curve $(90-\theta)$ in zone A 2 speeds up and the slow-element curve $(30+\theta)$ slows down which is contrary to the effect of Rule 9. In zone A 3 on the other hand the curve $(30+\theta)$ corresponds to the fast element decreasing, and the curve $(90-\theta)$ corresponds to the slow element increasing, which satisfies the effect found by Rule 9. Consequently zone A 2 now may be discarded safely. In the same manner it may be found that zone B 2 safely may be discarded.

Rule 12. Thus there is left in the table of Rule 5, the following:

No. 1 at 20 per cent power factor lagging.

No. 3 at 95 per cent power factor lagging.

No. 6 at 20 per cent power factor leading.

To distinguish between these three it is necessary to draw upon a knowledge of local load conditions. In the particular case of this example the load was an induction motor running idle and therefore it was known that the power factor was below 50 per cent lagging. Therefore No. 1 is the actual meter connection.

Rule 13. Since the speeds of the elements were alike originally, Table 1 shows that to change group 1 (like speeds) to group 1 (unlike speeds) it is necessary to interchange the voltage leads. That is, put those leads that were on the bottom element on the top element. Also, since the power factor is below 50 per cent, so connect the voltage leads to the slow element that it rotates backwards.

After these tests and changes the meter may be pronounced correctly connected.

Editor's Note.—This is the third of a series of four articles taken from Bulletin No. 8 of Purdue University Engineering Extension Service. The fourth will appear in a subsequent issue and will cover a second example of the application of the Jones check to a typical meter problem, the author's conclusions and a bibliography.

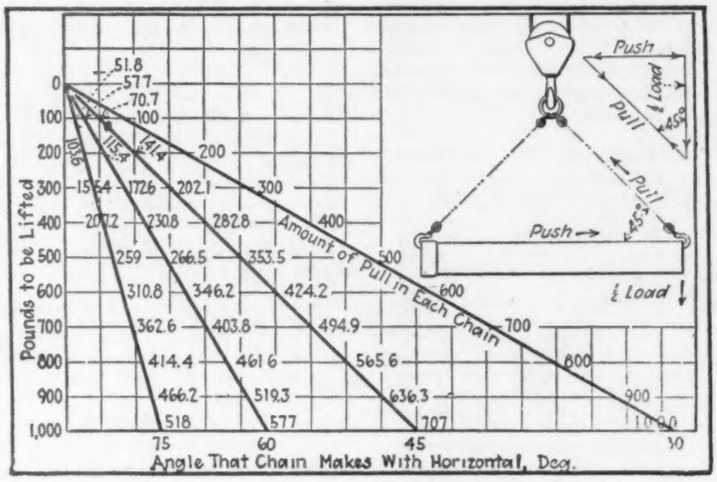
Safe Working Loads for Slings Are Shown in Chart

On construction work or even around a power house or substation during maintenance work it is not infrequent that hoisting slings are overloaded even though employed to lift a load well within the safe working limit of the sling cable or rope. This sounds like a puzzle or an enigmatic statement but truly is neither. It is all too true and easily justified by simple mathematics as indicated in the accompanying illustration.

As shown in the illustration the easiest and most likely method of attaching a sling to a bulky object such as the piece of pipe shown involves the separation of the two halves of the sling at a comparatively wide angle. Whenever the slings are thus separated the actual pull in each half of the sling is increased by a factor depending upon the angle as indicated.

Assuming the slings and the pipe to be of such a length that the angle between one of the cables or ropes and the pipe is 45 deg. as shown. Assume further that the pipe weighs 500 lb., thus imposing a normal downward pull of 250 lb. on each half of the sling. The entire weight of the load is carried by the ring on the block hook and thus the 250-lb. pull in each cable is increased by the "push" of the pipe itself. This "push" represents the force that is necessary to hold each cable with its 250-lb. vertical load 45 deg. away from the normal vertical position at the ring. In this particular case the 45-deg. angle imposes an extra load of 41.4 per cent. This means that instead of but a 250-lb. load each cable in the sling is carrying a 353.5-lb. load.

The diagram shown in the illustration gives direct sling-pull values for loads up to 1,000 lb. and for angles of 30, 45, 60 and 75 deg. Other values may be figured by proportion or by a reconstruction of the chart wherein the desired loads and angles are drawn in in the same proportion shown in the chart. This chart was prepared by the California Safety News, published by the safety division of the California Industrial Accident Commission.



Safe loads for hoisting slings at various angles.

The skilled lineman is not always the safest lineman.

The expert operator is not always the safest operator.

Use your head; it pays.

The Foreman Says

Before you read further, look at your hands and feet. Look at them intently. Look at them, if you can, as a brave man condemned to die must surely look for the last time upon the earth, the sun and the sky.

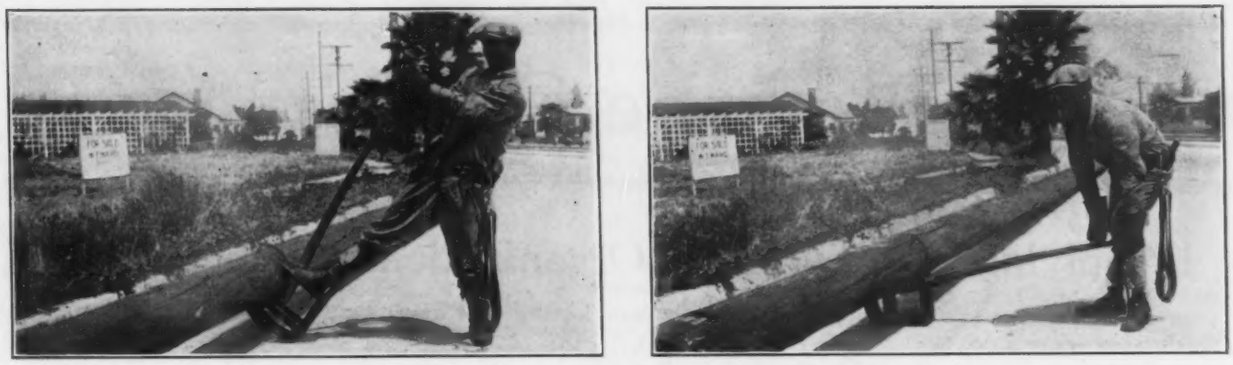
They are yours. Everything that you have they have provided for you. Tomorrow they can provide you more.

But if you lost them—what of that? Dare you lose them? Think!

Your obvious answer is the reason for those two little words, "Safety First." Safety is not "bunk." It is as vital to you as the air you breathe, the water you drink, the food you eat.

If you have not previously believed in Safety First, Safety Last, Safety always, take it now as your creed. Believe in it, think it and act it. Upon it depends all that you have, all that you are and all that you may hope to be. Look at your hands and feet.

—Contributed.



Pole cradle simplifies and makes more safe the handling of poles.

Pole Handling is Safe and Easy with Simple Cradle

By R. E. CUNNINGHAM, Farnham & Cunningham, Los Angeles

During all the years of pole-line construction, all crews have followed very much the same practice in lifting poles into position for framing, which has been to lift the pole up bodily while a support was placed under it. Although many men have been injured in doing this work it seems that no one gave the matter any thought in regard to developing a device which would do this work safely and easily. Following several serious injuries in a certain line crew the superintendent said to his men, "Why don't some of you fellows make up a device for lifting poles that will prevent any further accidents?" This was the challenge which resulted in the development of what has been called the "E-Z-Up" pole cradle. Now the general comment is, "it's so simple, why did not someone thing of it long ago!"

This cradle is a device using the cam principle to lift a pole into position for framing. It is made of malleable cast steel and all that is necessary in addition to the cradle itself is a cant hook or peevee which already is part of the tool equipment of every line-construction crew. To operate the device it is necessary only to place the cradle against the pole and drop the point of the cant hook or peevee between the two rockers so that the end presses against the cross bar nearest the nose of the cradle. Then catch the hook in the opposite side of the pole and by pulling back on the handle and at the same time pressing one foot against the heel of the cradle the pole is rocked into position. The accompanying illustrations show the application of the device.

In case the pole does not lie with the proper face up it can be rotated easily in the saddle of the cradle by the use of the cant hook.

If it is desired to raise one end of the pole to a higher position the cradle may be placed between that end and the center of gravity of the pole. With the cradle at the approximate center of gravity of the pole one man easily can turn the pole end-for-end by adding his weight to the high end of the pole. A lineman of average weight has no difficulty in lifting a 65-ft. cedar pole with this device.

Where the work is to be done on soft or sandy soil a board or thin steel plate may be placed under the cradle to keep it from sinking into the ground.

A cost of only 1½ cents per gallon of reclaimed circuit-breaker oil is claimed for the Sharples process. The purifying outfit can be handled by one man and may be operated either intermittently or continuously according to specific requirements. Contaminated oil may be handled at the rate of 150 gal. per hr., passing through four 6-kw. heaters, a mixing tank where a reagent is added, a centrifuge, a second mixing tank where a second reagent is added, a second centrifuge and thence to the clean oil storage reservoir.

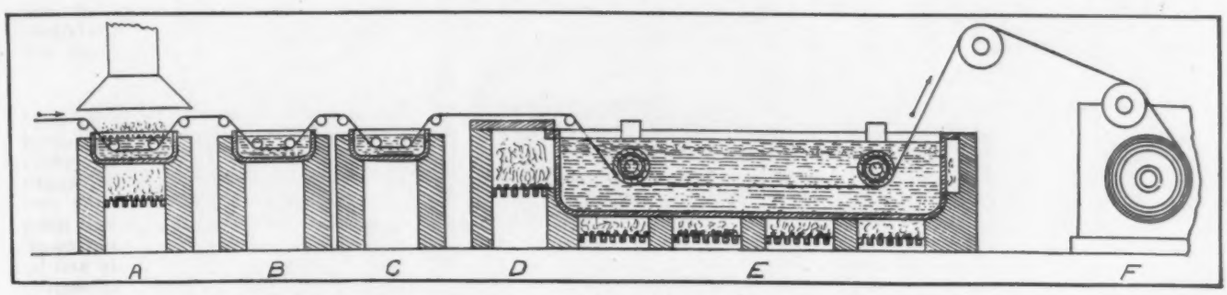
Correction

In the article, **"Analysis of Current Transformer Tests—II,"** by the same author, appearing on pages 210-211 of the April issue of Electrical West, the secondary current vectors I_b and I_d (Fig. 10) are respectively 180 deg. out of place; also the secondary current I_a in the wiring diagram (Fig. 10) should be I_d. In Fig. 11 of the same article the explanatory equation should read: $-I_d = +I_c = -(I_a + I_b) \supset +I_c - R$. In the first column on page 211, twelfth line from the bottom, the equation $I_c = 3.05$ should be $I_b = 3.05$; in the second line below that the value I_c should be I_d; in the line below that, the value I_c should be I_c.

Correction

In the article, "Action of Series-Connected Current Transformers," by E. C. Goodale, printed on page 416, Journal of Electricity, Dec. 1, 1926, in the thirteenth line from the bottom of the first column on that page the current transformer ratio given as 100/5 should have been 10/5.

How Wire is Galvanized



Schematic diagram of steps in the continuous process of galvanizing steel and iron wire. The wire passes successively through a molten salt bath (A), through washing dip (B) and fluxing bath (C), passes over heated surface (D) where it is dried, thence through galvanizing bath (E) and on to the winding reel (F), cooling between (E) and (F). Bath (A) is covered by a patent of the Indiana Steel & Wire Company and contains carburizing material the use of which is claimed to increase the bond between wire and coating.

Ideas for the Contractor

Applying "Big Business" Organization to Contracting

When Two Bakersfield Contractor-Dealers Consolidate Each Selects Specialty and Corporate Set-up Is Established Which Cuts Overhead and Builds Business

WITH their feet cocked up on the bed, reclining in chairs on each side of a hotel room two men sat, discussing the future of electrical contracting and electrical merchandising from the small dealer angle.

"The day is going to come," sagely remarked one, "when the contractors will get on to themselves and apply a little of the business instinct to their trade that the grocers and the other boys have to theirs. The day of the small individual contractor, like that of the corner grocer, is going to pass and three or four bright chaps are going to get together and form a corporation. Each one will be assigned definite classes of work to handle. They'll work independently and yet co-operatively, and they can do a job of contracting that will change the status of contracting from that of lone wolf with the world his enemies to that of mass attack."

Most of the night was spent in going into the possible ramifications of such a plan, with one contractor specializing in house wiring, another in industrial stuff, a third in motor repairs and rewinding, and a trained sales force out selling jobs on superior quality and class and not on price, a single supply and transportation department with one overhead for the entire organization, and an accounting and a legal department to provide soundings that the ship of contracting might be steered in the right and safe channel.

But this was all theory.

Not long ago, however, two contractors in Bakersfield conceived a similar idea. The verdict rests in the hands of the future, of course, but operation of the plan for several months seems to indicate that it will be successful. Certainly its operation will merit the critical analysis of electrical contractors everywhere.

The Idea in Practice

Tom Drury, who had operated a contractor-dealer establishment under the name of "W. T. Drury, Electragist," and Sam Fingerhut, formerly conducting the Acme Electric Company, both of Bakersfield, Calif., affiliating with them a prominent attorney in whom both had confidence, took out papers for the incorporation of the firm of "Drury-Fingerhut, Inc., Electragist" early this year. The move was the result of several months of deliberation and careful planning.

Consolidation is no new fancy of business. It has worked well with large industries. Whether it will work with a group of small businesses is to be seen demonstrated in the chain store idea, now growing in importance. Two electrical contractors of Bakersfield are trying it on the electrical business. Their organization is interesting and will bear watching. A complete review of it is presented here.

The result of this planning is that the Drury-Fingerhut organization outline is one of the strongest, because most logical, of set-ups for a partnership that can be devised, experience in other lines of business has proved. It was realized, at the outset, that if the organization was to be a success, neither man was to interfere with nor lean on the other. Each had to be independent in action and yet have definite responsibility in the undertaking. The field of each had to show in its results the individual worth to the organization of that man's efforts. And yet each must work to the interest of the organization as well as for himself.

Located on a main thoroughfare is the attractive store of two independent contractor-dealers now functioning as one.

"We realized," said Tom Drury, "that the electrical contracting business was no different than any other business. The handwriting is on the wall. We must adopt co-operative measures in this business or we are out of luck. I figure that the days of the one-horse electrical contracting business are gone. The chain store idea is teaching us the way we will have to go."

He went on to describe the organization set-up under which he and Mr. Fingerhut are operating.

In Charge of Sales

Sam Fingerhut is placed in charge of all sales and merchandise. He does nothing whatever in the estimating or construction ends of the business. As the district agency for Frigidaire the Drury-Fingerhut company has a strong feature line of merchandise. During the summer period especially, Mr. Fingerhut operates a sales organization of six salesmen and a supervisor on refrigeration alone. All appliances and ranges, water heaters, etc. are sold under his direction. During the winter months it is his intention to train this sales force to do range and appliance selling under a plan similar to that of the refrigeration sales of the summer period. Four men besides the refrigeration force are on the appliance end of the business.

Radio by Radio Men

Radio is handled by two radio men, Osborne and Williams, who themselves conducted a radio store in Bakersfield not long ago. This store was bought out by Drury-Fingerhut and the two men retained to take charge of all radio sales and service. This department, then, is also handled separately and by men trained to handle it efficiently, without interference from the rest of the organization. It is responsible for results, and must, of course, maintain the policies of the organization.

In Charge of Construction

Tom Drury is in complete charge of the estimating and construction, of the fixtures and all matters pertaining to wiring and installations. He has a force of nine men at the slack times and many more during good construction periods. Before going into detail as to the well laid out arrangement of stock and fixtures and of the job plan used by Mr. Drury it will be interesting to consider the remainder of the organiaztion set-up.

Expert Accountants Keep Records

Books and acounting are handled by a firm of expert accounants—The O'Hare Accountants. These accountants have installed the bookkeeping system and maintain a daily check over the accounts. Two girls are kept in the office, located on the mezzanine floor of the store, to tabulate and record the daily business, the job costs, time cards, and to handle correspondence. Modern office equipment, including dictaphones, is used, promoting efficiency and saving the time of all concerned.

The legal aspects of the business, of course, are handled by the third member of the firm. Stock in the corporation is held on a basis of 49 shares each for Drury and Fingerhut, with the deciding two shares held by the attorney.

Arrangement of Store and Shops

The physical arrangement of the store, display rooms, office, stock rooms and shop are themselves ingenious. In forming the new corporation a store next to Drury's former store was obtained for the main sales floor and office. The rear of Drury's old store was retained and walled off, the street front rented to other tenants.

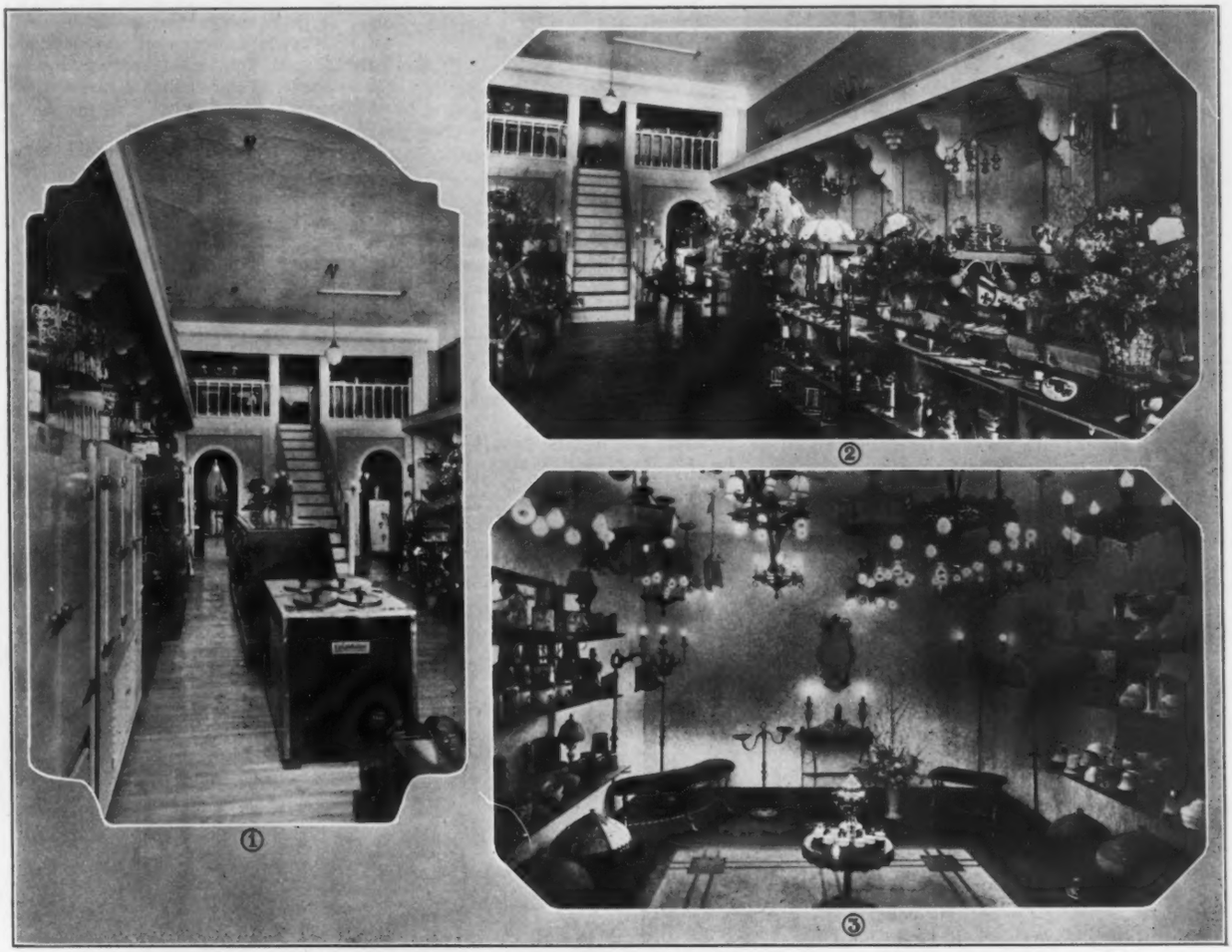
As one enters the new store, through the entrance between two well lighted and decorated windows, the entire left wall and indeed half of the floor space is seen to be utilized as a display of all models of the refrigerators carried. According to Mr. Fingerhut not many remain on the floor long, being sold from the floor as fast as set up and demonstrated. At the right are show cases and shelving for the display of appliances and novelties, the smaller lines of merchandise.

Forming an L at the rear, left, in a part of the former store, is an ample fixture display room, a picture of which accompanies this story. A small room for displaying competitive lines of fixtures is also provided. At the rear of the store are stairs leading up to the office on the mezzanine floor. Underneath the mezzanine is located, at the left, the radio display and testing room; at the right another display room for ranges or refrigerators.

From the office on the mezzanine leading to a room over the fixture room on the main floor is a large space used as a stock room for small fittings and fixture parts, as well as a small shop for assembling. A stairway from this room leads down to a shop on the main floor, back of the fixture display room but entirely cut off from it. This is the main shop of the establishment and is accessible only from the alley entrance or from the office above. This keeps journeymen and helpers out of the store. If they have business in the office they reach it by means of the stairs through the stock room only. A basement comprising the space under both stores, is used for major storage of conduit and heavy materials, appliances, etc. Altogether 5,000 sq. ft. of floor space is available and put to efficient use.

Interconnecting phones bring all departments into close touch.

The overhead of this company has been less consistently than the combined overhead of both contractors before.



Store interiors. At left the refrigerator display. Radio room may be seen through door at rear. Right: the better fixture display room. A competitive fixture display room is also provided. Above another interior of the store, showing display of smaller appliances.

Why a Standard Electrical Ordinance

First of a Series of Short Discussions on the Value of a Uniform Ordinance Both to the Public of City or County and to the Industry

By JAMES M. EVANS, Electrical Engineer, Board of Fire Underwriters of the Pacific.
Los Angeles

COMMUNITIES throughout the country are begining to feel the need for the regulation or inspection of electric wiring. Fires of increasing frequency and correspondingly greater proportions will arouse any community, but what to do and how (with limited funds from taxes) is a proposition that seems hard to solve. When these fires are caused by electric wiring, the feeling is that they are preventable; that the owner paid for the proper quality of wiring, and that something should be done that will curb the too frequently dishonest contractor and give the property owner protection and assurance that he will not some night lose his home and possibly his loved ones because of defective wiring in his or adjacent buildings.

Can Least Afford to Lose

From a conflagration standpoint fires in isolated homes are not so important, but is it not true that in these cases frequently the ones who lose are the ones who least can afford to do so?

It is a sad thing to see the general contractor try to save in the electric wiring one-half of one per cent on the cost of the house, knowing full well that he is gambling with the owner's property and life.

The dishonest general contractor or the occasional equally dishonest electrical contractor will be the ones who will fight any kind of regulation and inspection. "An ordinance is a good thing," they will say. "Sure, it is"—(an excuse for an increase in the contract price) "but inspection, especially rigid inspection, is just throwing good money after bad."

If one listens carefully to their arguments he can see a strong similarity in them to the arguments of the "safe and sound" mining or oil stock salesman for a Delaware corporation.

The usual starting point for such an argument is "cost" with a positive statement that inspection will increase the cost. However, a check among customers in inspected and uninspected territory will soon convince any unbiased person that there seems to be little difference, and that difference is frequently in favor of the inspected jobs; even as there is also little variance in the final figures between those of the contractor with a 30 per cent overhead who makes a bid for your work on a cost plus 10 per cent basis, and those of the one who says, "No, my overhead is 30 per cent and I am entitled to a legitimate profit."

Gets a Twenty-Dollar Better Job

It is easy for any community already incorporated to get good inspection if the district covered has eight to twelve jobs per day, and this without any increase in taxes. The contractor pays for permit and inspection, usually not over one or two dollars, and adds it openly to his bill. The owner for the one or two dollars extra gets a twenty-dollar better job.

It is entirely possible for two or three communities, each too small to get a good man alone, to co-operate in getting inspection and thus get first-class service. A county is in an especially advantageous position for such work.

The California Association of Electrical Inspectors is trying to be of practical service to those communities not in a position to hire legal talent conversant with the electrical industry. Accordingly, at a recent meeting it adopted a form of ordinance which can be put on the statute books at little expense by any municipality or group of municipalities, and, with slight changes, by any county. This ordinance embodies phraseology that makes it legal and enforceable in any other state of our Union by merely substituting the name of that state for "California" in the text. It is quite short—it can be printed in about three newspaper columns with type as customarily used, and still it contains all desirable and necessary clauses. Concise, but workable, it is fitted to the needs of any community, large or small, but particularly those communities desiring to save the expense of publishing a large code. Another short article on the proposed standard electrical ordinance will be published next month. Meanwhile copies of it are available from the secretary of the association, C. W. Mitchell, 914 Merchants Exchange Building, San Francisco, or the writer, chairman of the ordinance committee, Box 1360, Station C, or 1014 Insurance Exchange Building, Los Angeles, Calif.

Night Lighting for Outdoor Sports—III

Last of a Series Briefed from a Recent Bulletin and Applicable to Western Sports

By O. F. HASS and H. M. SHARP
National Lamp Works of the General Electric Company, Nela Park.

LAST month, continuing a consideration of some of the best practices in the lighting of outdoor sports so that they may be engaged in at night, the subjects of swimming pool, volley ball court, roque and croquet courts, horseshoe pitching pit and football field lighting were discussed. (See Electrical West, July 1, 1927, p. 32.) In the previous issue (June 1, 1927, pp. 473-474) the general problem of night lighting for sports was outlined and the specific problem of the tennis court was detailed.

In this present instance, concluding the series, lighting for bathing beaches, race tracks, indoor baseball fields and trap shooting ranges is given consideration and recommendations are made for satisfactory yet economical illumination in each instance.

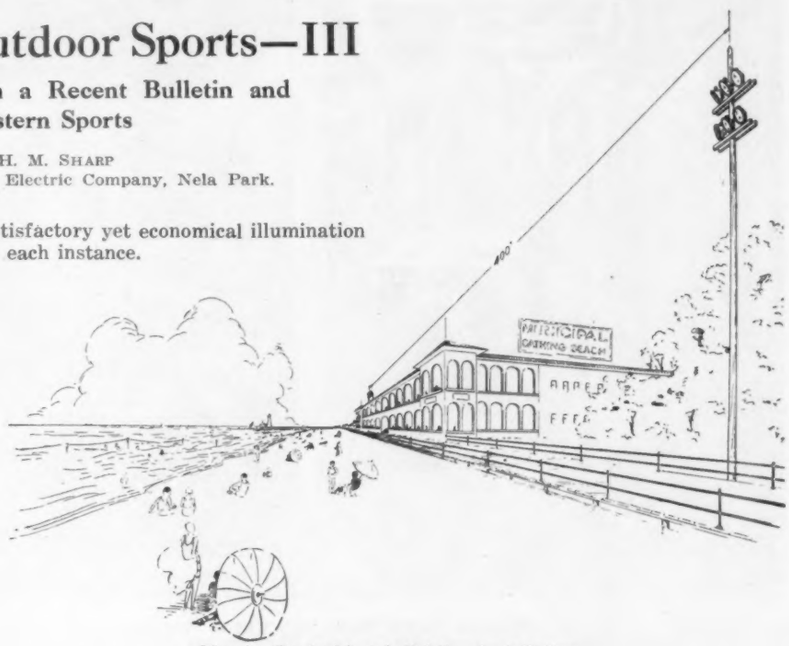


Fig. 1. Typical beach lighting installation.

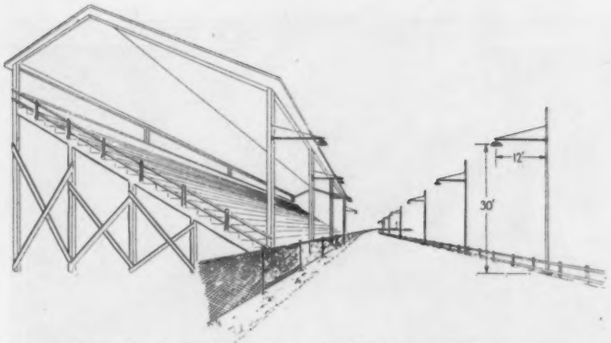


Fig. 2. Arrangement of standards at grandstand.

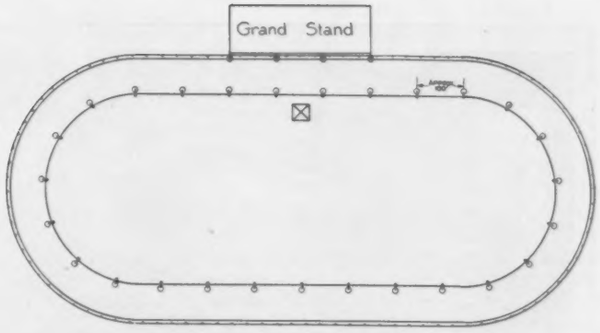


Fig. 3. Placing of units for race track lighting.

Bathing Beaches

In the interest of safety and general satisfaction, the illumination for bathing beaches must necessarily be of sufficient intensity and of such distribution that all parts of the beach are visible from the life saver's and overseer's stations. The recommended method employs about 25 watts per linear foot of beach with a maximum spacing between the groups of floodlights of 400 ft. Fig. 1 shows a typical lighting layout for a municipal bathing beach.

Race Track

Night lighting for race tracks, in order to be satisfactory, must provide sufficient illumination so that drivers and spectators alike have clear vision throughout the entire course; heavy shadows must be avoided, since they would prove confusing to the horses and drivers; glare should be minimized. Fig. 3 shows the complete layout of a lighting system which meets these conditions. Standard RLM dome reflectors with 1,000-watt Mazda lamps are used. These are mounted 30 ft. high on poles placed every 100 ft. around the inside of the track, and extending out over the track on a 12-ft. bracket. In front of the grand stand an additional row of units supported from the building is used to facilitate the starting and judging of these races and to permit various forms of entertainment to be carried on.

If They All Did It

[Worth repetition and therefore borrowed from the bulletin of the Electrical League of Utah.]

A certain man was critically ill. But he wouldn't send for a doctor until he had had all the M.D.'s in town bid on his case. He took the lowest offer and the bill was charged against his estate.

A rich man wanted a chauffeur. He required all applicants to mention in sealed bids the amount per week for which they would serve. The fellow with the lowest figure got the job. The rich man had time to reflect in the hospital that he had been sparing with his dollars, but reckless with his life.

An innkeeper was letting his contract for butter and eggs. He gave it to the merchant who made the best price. Now he is looking for a painter to make him a sign that reads, "Closed." The lowest bidder will get the job.

A young man went shopping for a diamond. His quest was for a stone at the lowest possible price. They told him, a week later, where he tried to "hock" it, that the thing was only paste. "Maybe," he exclaimed in a gasp of disillusionment, "maybe that was the reason!"

Indoor Baseball

Fig. 4 illustrates a method of night lighting indoor baseball diamonds, which provides for sufficient illumination on the ball throughout its entire flight and at the same time minimizes the amount of direct light reaching the player's eyes. The floodlights are mounted 35 ft. high in the positions indicated on the sketch. Two poles, each carrying two floodlights, are mounted on the continuation of the line between first base and second base and between third base and second base respectively, 20 ft. back from the foul line. At a distance of 150 ft. from home plate, two other poles are mounted 10 ft. from the foul line, as indicated, each carrying six floodlights. The floodlights for this purpose should be equipped with 1,000-watt Mazda lamps.

Trap Shooting Ranges

The recommended method of lighting for trap shooting ranges is the following: Four projectors, equipped with 1,000-watt Mazda lamps, are located behind the shooters' stand, 20 ft. above the ground, as indicated.

The reflectors should be so directed that the course of the clay pigeons is evenly illuminated. The most satisfactory results will be obtained when the beams cross, that is, when the two reflectors at the right are used to illuminate the left half of the range and the two at the left directed toward the right half.

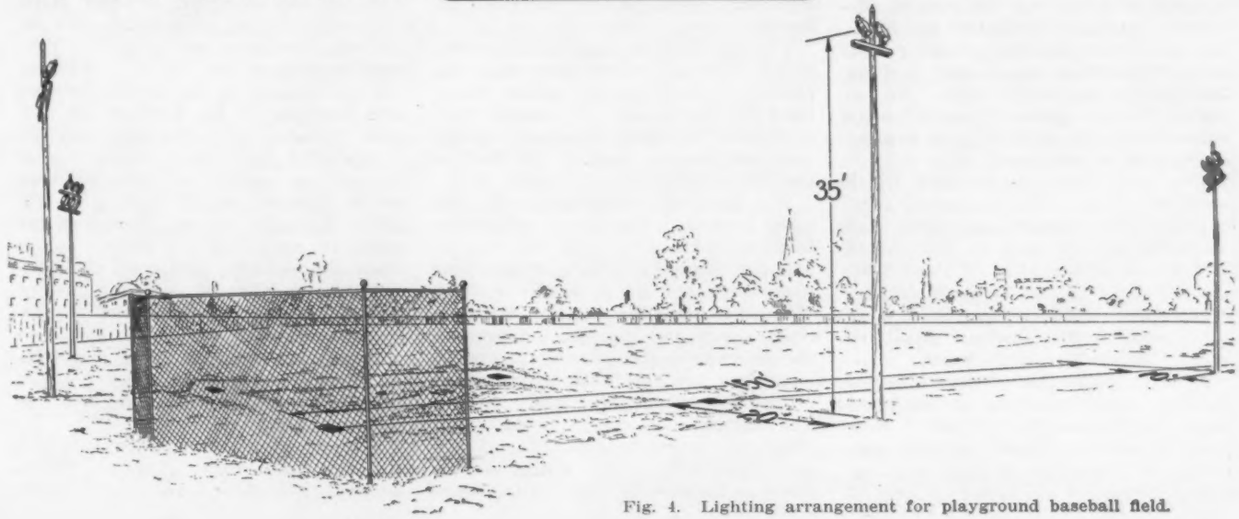


Fig. 4. Lighting arrangement for playground baseball field.

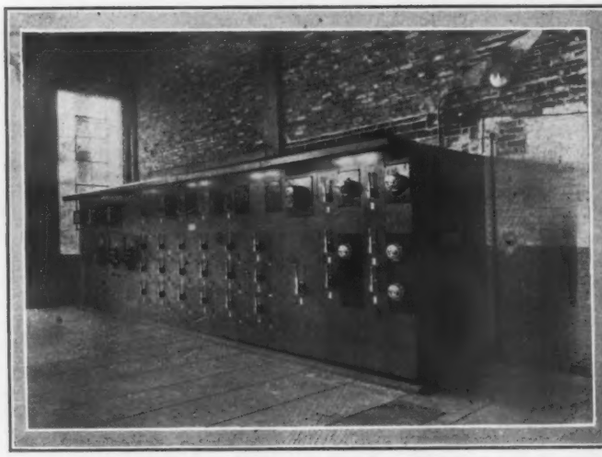


Fig. 1. The front of the main switchboard.

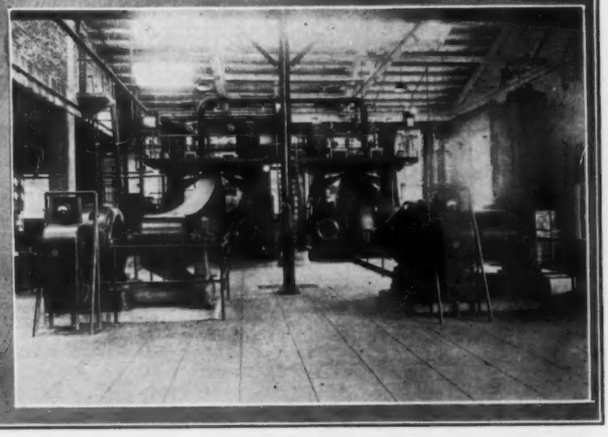


Fig. 3. Ammonia compressors and motors which replaced steam engines.

"New Plants for Old"

Pasadena Ice Plant Remodeling Involves Development of Many New Features in Electrical Installation and Adds to Plant Efficiency

THUS does industry lay its imperative demands before the modern engineer. And the engineer rubs his present day Aladdin's lamp—electricity—and lo, the deed is done.

The new plant recently completed for the Pasadena Ice Company, at Broadway and Glenarm Streets, Pasadena, Calif., is typical of the results being obtained in modernizing plants which have become obsolete.

The new plant contains not alone all the latest types of standard ice making machinery, but several pieces of equipment especially built for this plant, and never before used. The original plant has been entirely rebuilt, or absorbed into the new one, obsolete equipment having been removed and the latest types substituted.

The old smokestack has been felled, motors have replaced old type steam engines and pumps, and walls have been removed to make way for modern efficiency. Adequate ventilation and lighting have been provided, resulting in a clean, wholesome environment inviting to employee and visitor alike. No expense has been spared to provide every known device for producing the clearest and purest ice obtainable.

The two York compressors which were originally driven by cross compound Corliss engines, and have been converted in this case to belt driven units, were purchased in 1914 and 1906, making them 13 and 21 years old, respectively. These compressors were purchased to manufacture about 60 tons of ice each every 24 hours.

By the installation of new types of freezing and evaporating systems, and improving on the multiple effect compression scheme utilized by these machines, the capacity of each unit has been increased to 105 tons, or a total of 210 tons plant capacity, by increasing the speed 28 r.p.m. In other words the capacity has been increased about 75 per cent with an increase in speed of 30 per cent.

Marked improvements have also been made in the harvesting of the ice. At least 210 tons per day is harvested from these freezing tanks by one man on each shift, that is, three men per 24 hours. These men discharge the ice from the molds, refill the molds, replace in the tank, remove the concentrated cores from the freezing blocks, and refill with fresh water. The ice which is discharged from the molds is upended by automatic machinery and delivered in the ice storage house standing on end. A total of 210 tons per day is harvested and delivered in the day storage room by one man per shift. The York company engineers claim this record for harvesting clear ice is not approached anywhere in California.

The cold storage plant involves meritorious features which are most important in maintaining proper conditions for the storage of delicate commodities. To obtain the results desired required positive control and regulation of humidity and ventilation.

The electrical installation in this plant presents a number of interesting features because of the number of manufacturing operations which have been converted to automatic control. With the exception of the ammonia compressors, the large air compressor, the motor-generator set and the cranes, all motors are controlled by means of magnetic switches and push buttons. The electrical equipment is controlled from one main switchboard and two subswitchboards. The main switchboard is located in the engine room, while sub-board No. 1 is in the tank room and sub-board No. 2 is in the cold storage department.

A special 3-phase overhead line is carried direct from the power station to the ice company's premises, a pole top disconnecting switch being installed on the last pole. From the overhead lines the current is carried by means of an underground cable to the main switchboard. After passing through a test panel and disconnect-switches, the current goes through the main 2,200-volt oil circuit breaker to the transformer room, where it is stepped down to 440 volts. The ice company purchases current at 2,200 volts, assuming all transformer losses. A graphic recording wattmeter is provided on the incoming 2,200-volt circuit, and all current entering the plant passes through this meter.

Current at four voltages is necessary to the operation of this plant. All motors on the compressing and circulating machinery and in the cold storage department are 440-volt, 3-phase. All motors used in the actual freezing and handling of the product are 220-volt, 3-phase. A motor generator set is operated to provide direct current for a large number of battery driven delivery trucks, and all lighting is 110-220-volt, single phase. Providing the necessary switching and control equipment, the metering equipment to segregate power costs of each department and designing new apparatus to provide the desired automatic operation served to present a number of problems of interest to the engineers and called for the expenditure of considerable money by the owners.

An inspection of the photographs and the schematic wiring diagram, shown herewith, will serve to show the thought

given to the design of the electrical layout of the plant. Fig. 1 presents a front view of the main switchboard. It is of the "dead front—live rear" type with all live contacts installed on the rear of the board. Four oil switches are shown at the extreme left of the board, the first one being on the 2,200-volt incoming line, with the main graphic recording wattmeter above it. The next one is the oil switch controlling all secondary current from the transformers on the 440-volt side, and is also provided with a graphic recording wattmeter. The next two oil switches control the two 150-hp. ammonia compressors, and the wattmeter shown above them records the amount of "factory power" used.

The center section of this switchboard carries the switches controlling the individual 440-volt motors, the control switches for the subswitchboards, the push buttons for operating the magnetic motor switches, and the recording wattmeters which register the segregated power costs for each department. The reset trigger for all G.E. No. 7006 magnetic switches (which are mounted on the rear of the board), project through the front of this section. This scheme eliminates the necessity of the operator going to the rear of the board to "reset" any of the magnetic switches. As will be noted, two blank ebonite panels are provided for the installation of future wattmeters.

The panel shown with the single switch and 3-phase meter above is for controlling and recording the total output of 220-volt power used in the plant. The right hand section of the switchboard carries the control switches and meters for the lighting installation throughout the plant and offices. Each department is separately switched and metered. The grille door shown at the end of switchboard was purchased from an elevator equipment manufacturer and represents an improvement over the flimsy type of "diamond mesh" door usually seen on switchboards. Another interesting feature of this board is the method used in lighting its face. At the upper edge will be noted an inverted trough of hood shape. Twin sockets are installed inside this trough. This form of construction distributes a diffused blanket of light over the total area of the board eliminating all glare and making the reading of switch tags and meters extremely easy. This switchboard is constructed of steel throughout and all parts are finished in marbelized enamel and lacquered.

In Fig. 2 is shown the rear of the main switchboard. This view shows very clearly the arrangement of buses, magnetic switches, line switches, fuses, oil circuit breakers, current transformers, etc. As will be noted, all conduits are brought through the floor, thereby eliminating the necessity for a large unsightly "tangle box" at the top of the board. At the extreme right can be seen the other grille door for providing free access to that end of the board. An unusual feature of this installation, not found in most plants, is the large amount of working space provided at the rear of the board. The adequate lighting provided is another very desirable feature.

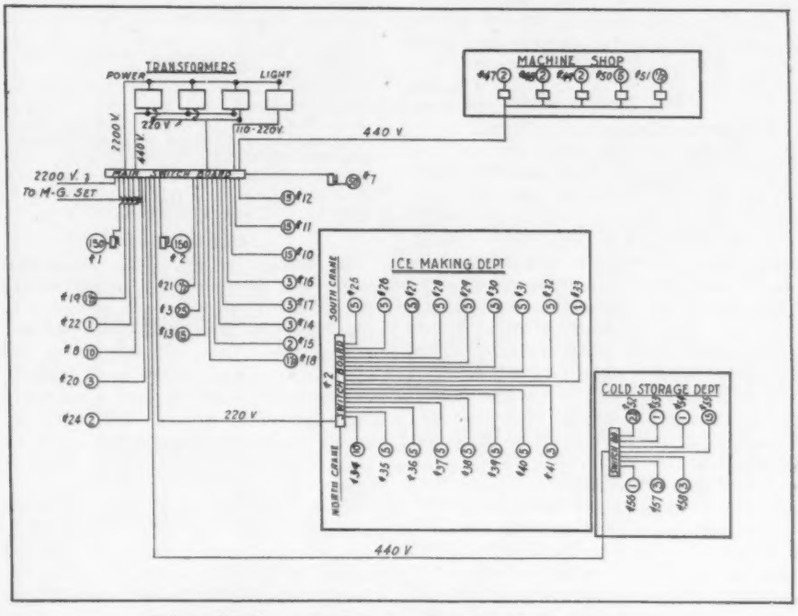
Another unique point in the construction of this board is also shown in this view. This plant is equipped with a very complete sprinkler system, several of the heads being placed on the ceiling adjacent to the main switchboard location. It can be seen readily that much damage and danger would result should one of these heads "let go," thereby permitting water to flow over the rear of the switchboard. To eliminate this danger a steel roof was built over the rear of the switchboard and was given a sharp pitch toward the front side.

Fig. 2. Rear of the main switchboard.

In Fig. 3 can be seen the ammonia compressors which were formerly driven by steam engines. This view shows the discs covering the former driving rod port on each compressor. The 150-hp. outboard motor for each compressor can also be seen in the picture. It will be noted that each starter panel is provided with an ammeter, so that the current demand of each machine can be checked under all conditions of load. The picture also shows the simple yet effective pipe frame provided for mounting the hand operated compensators. These pipe frames are built of 1½-in. black iron pipe, with all front brace pipes solidly welded to the upright standards.

So much for the main equipment of the plant. Space in this issue will not permit going into further details in one article. Therefore a concluding discussion of the remaining features of this installation will be conducted in these columns next issue. The photographs of other parts of the plant, and particularly of the modern ice handling equipment, will be presented thus in larger size and greater detail.

Conduit and Wire Proportion on Average Job.—Figures given out following a survey made by jobbing organizations show that from 10 to 12 per cent of the electrical contractors' purchases are for wire, indicating that wire runs from 10 to 12 per cent of the cost of an electrical job. Conduit, on the other hand, according to purchase records, runs two and a half times this amount, or very nearly 25 per cent of the contractors' purchases.



Schematic diagram of electrical installation in ice plant.

Keeping Paint from Clogging Ventilator Fan Blades.—Where difficulty is experienced in keeping the blades of a propeller fan free from paint, especially in jobs using fans for exhausting fumes from spray painting operation, a clever idea was contributed recently following the experience of the Standard Oil Company in one of its shops. A liberal coating of vaseline on the blades of the fan insulates them from paint spray and keeps the paint from sticking to the metal of the blade. Both paint and vaseline may be removed every once in a while and the efficiency of the fan maintained. In equipping a spray booth with a ventilating fan, the suggestion of fan manufacturers is that fans with fewer blades are more desirable than those with a number of blades for this type of work. The former allow more air space through which the fumes containing lead and paint may pass without accumulating on the blades of the fan, finally choking them and cutting off the circulation of air.

First In the Field

In San Francisco a little Ford truck may be seen about the streets with familiar wire and electrical supplies dangling over the rear wheels.

On the roof of the cab, however, is a sign proudly displayed. It bears the lettering "We wired the first Red Seal plan house in San Francisco. Being the pioneers, see us first—Kent Electric Co., 240 Third St., San Francisco." On each side of this are emblems, one the electric Red Seal home emblem and the other of the Association of Electragists, International.

Theodore Kent, proprietor of the Kent Electric & Hardware Company, was not only the first one to make application for a Red Seal certificate but he anticipated the actual beginning of the campaign and was at the headquarters of the California Electrical Bureau two or three months before the campaign was actually started, insisting on being the first to take advantage of the plan.

Cartoons Used to Sell Home Rewiring.—Briggs, the eminent cartoonist, fired the opening gun of the Copper & Brass Research Association's campaign for better wiring and rewiring with a humorous cartoon.

Space Heaters Applicable to Variety of Uses

Limited Only by Ingenuity of Estimator as They Present Most Flexible Means of Electric Heat Utilization

Electrical Estimating Series XXVI

AFTER a brief survey of the uses of electric melting pots there will be next considered in this article some of the vast number of possibilities for the application of electric heat through the means of space heaters. With the latter it might be said that their field of usefulness is only limited by the imagination of the estimator employing them. While a number of these possibilities have been explored with satisfactory results the future applications of these flexible mediums for the transformation of electric energy into heat at high efficiency will develop rapidly.

Metal Melting Pots

The most common type of metal melting devices consists of a pot with a heating element in the bottom. This equipment is designed for melting metals whose melting point is below 600 deg. F. The list includes type metal, lead, babbitt metal, tin, pewter, solder, etc. Usually such pots are equipped with 3-heat units and sectionalizing switches. The high heat is used to bring about quick fusion while the lower heats keep the metal melted. Several sizes of pots are available, the larger sizes being of capacities up to 1,500 lb. of metal.

Such pots are used quite extensively in print shops, engraving plants, electrotype foundries, bearing factories, etc. Electric solder pots are used in a great many factories where a great deal of soldering is done. The main advantages claimed for electric melting pots are: freedom from fire hazard, absence of wasted heat, uniformity of metal temperature and minimum oxidation loss. There are many uses for these pots in addition to those already mentioned and a study of their possibilities will well repay any one. Full information can be obtained from the firms listed below and others:

Cutler Hammer Manufacturing Company, Milwaukee, Wis.

General Electric Company, Schenectady, N. Y.

Fortified Manufacturing Company, Kansas City, Mo.

More-Jones Brass & Metal Company, St. Louis, Mo.

J. D. Wallace & Company, Chicago, Ill.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

American Metallurgical Corporation, Boston, Mass.

Harold E. Trent, Philadelphia, Pa.

Space Heaters

The foregoing exposition of typical commercial types of the larger makes of industrial heating equipment will serve to open a field of study of unlimited possibilities. Aside from the completed apparatus commercially available, of which those types noted herein are but a very small part of the almost limitless number that are on the market, many makes and sizes of "space" heaters also are available.

These heaters are made in standard wattage ratings for both 110 and 220-volt circuits and provide a flexible method of applying electric heat to apparatus which has been originally designed for other forms of heating. They also lend themselves very readily to incorporation into heating devices which the contractor himself may design.

The writer has built a number of glue heaters, water baths, putty heaters, asphalt heaters, etc., using such space heaters to provide the heating medium. The units are usually about 1½ to 1¾ in. wide by 18 to 36 in. long, with the heating element protected by a metal sheath, and the terminals placed one at each end. This design results in a device which can be mounted easily upon porcelain knobs, or on insulated iron rods. The heaters are of very rugged construction and will stand a great amount of vibration. Due to their small size they can be installed very compactly, thus providing a large amount of heat in places where space is limited. They also have a certain amount of flexibility and, within limits, can be bent to follow the contour of the apparatus being heated.

These heaters lend themselves very readily to sectionalized regulation by means of any form of temperature regulation if such operation is desired. Among the standard methods of regulation now in use may be mentioned the following:

1. By dividing the heater into sections and changing the voltage impressed on each section by connecting the sections in different combinations.

2. By dividing the heater into sections, each designed for line voltage, and providing each section with a switch.

3. By use of a series rheostat. This gives closer regulation than methods No. 1 and No. 2, and does not complicate the heater by sectionalizing it. Rheostat control is particularly well suited to heaters developing small wattages.

4. By connecting the heater intermittently to the line, opening the circuit when

* All rights reserved by the author.

the maximum operating temperature is reached and closing the circuit when minimum operating temperature is reached. This is the method generally employed in automatic temperature control. A thermostat or other temperature responsive device is used and for low wattages opens and closes the circuit directly, or for higher wattages actuates a magnetic switch. By means of contactors properly arranged, wattages of large volume can be controlled easily and safely by this method.

5. By a time switch for connecting and disconnecting the heater at predetermined times.

In making use of these units several things must be kept in mind. Fundamentally the watt rating of a heater is determined by three general considerations:

First: the safe heater temperature, i.e., one that will insure a satisfactory length of life.

Second: the desirable operating temperature for the service.

Third: the fire risk.

The maximum safe operating temperature of the space heater is between 700 deg. and 800 deg. F. This is the approximate operating temperature of standard 500-watt space heaters when used under the condition for which they are designed, i.e., for heating air at atmospheric temperatures and with free ventilation. It is evident that if the heaters are mounted in an enclosure in which temperatures much higher than atmospheric prevail the temperature of the heater will be increased and it will therefore be overrated and its life shortened. It also is evident that if the heaters are crowded together so that there is an interchange of heat between them, one acting in such a way as to heat its neighbor, the safe operating temperature will be exceeded and the heaters may burn out unless the rating is reduced.

TABLE I

Safe Life Rating in Watts for Standard C-H Space Heaters in Ovens

Temp. of air in oven	Safe Watt Rating At 50 watts per cu.ft.	At 100 watts per cu.ft.	At 150 watts per cu.ft.	At 200 watts per cu.ft.
150° F.	450	425	400	375
250° F.	425	400	375	350
300° F.	400	375	350	325
350° F.	375	350	325	300
400° F.	350	325	300	275
450° F.	325	300	275	250
500° F.	300	275	250	225

Note: To determine volume, multiply length by width by depth. Knowing total watt requirements, to get watts per cu.ft. divide by volume in cubic feet.

Better to understand the term, "service rating," let us assume that we wish to install a standard heater in a plate warmer designed to keep plates or dinner service warm. While a standard rating might be used, the temperature would be 700-800 deg. F., and if the heater were in contact with or close to the chinaware would be very apt to cause breakage. To prevent this the plates should be spaced away from the heater or preferably shielded from direct radiation and connection, or a lower rated heater may be used; for example, a 220-volt heater on 110 volts, which will deliver 125 watts. (See Table II.)

TABLE II

Watt Rating at Various Terminal Voltages

Cat. No.	105 Volts	110 Volts	115 Volts	125 Volts	220 Volts	230 Volts	250 Volts
3357	455	500	550	645			
3358	115	125	140	160	500	550	645

Each heater will develop 500 watts when used at the voltage for which it is designed.

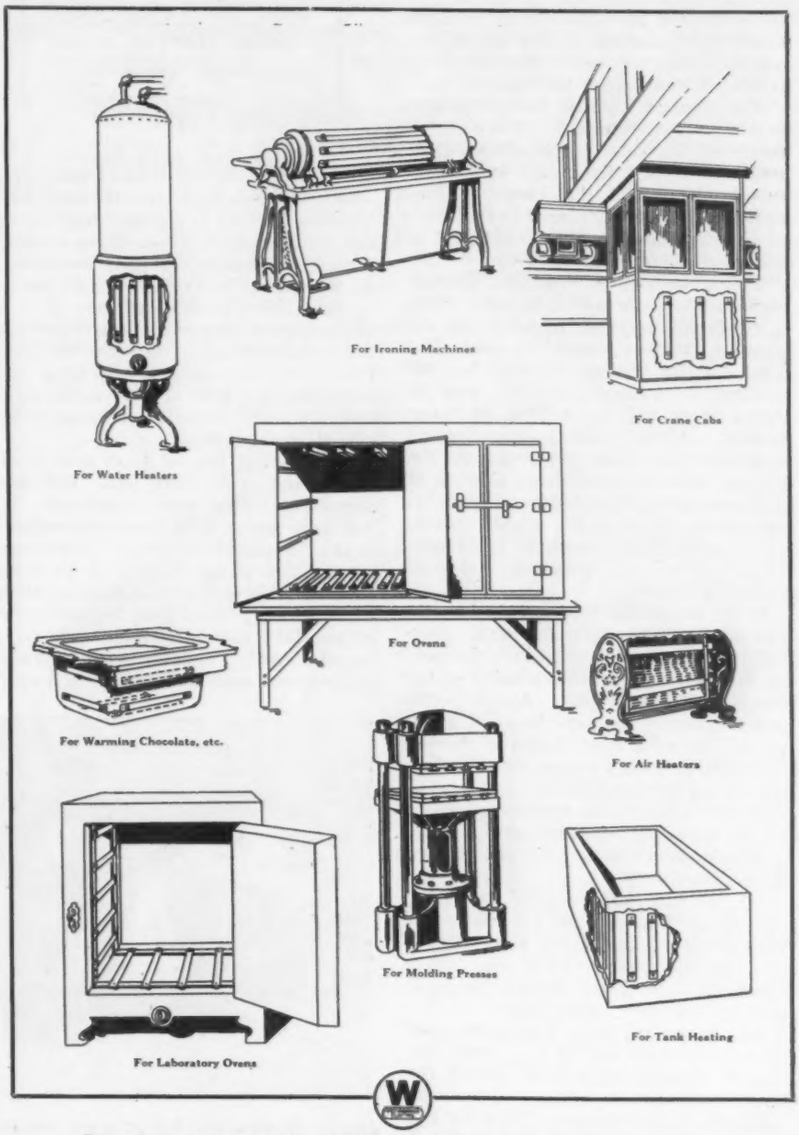
Temperature must be considered from the operation or service standpoint in any industrial process. In a package-sealing machine, while a standard rating might be safe so far as the heater is concerned, the high temperature might burn the glue or overheat the paraffine. Therefore a lower rating would be called for, not on account of the life of the heater, but on account of the operating conditions and the results to be accomplished. While these space heaters lend themselves to almost any installation, where the application of electric heat is desired certain fundamental rules must be observed if practical results are to be obtained.

TABLE III

Approximate Operating Temperature for Various Watt Ratings in Open Air

Temp. of heater with air at 70° to 100° F.	Watts
750°	500
700°	400
600°	300
500°	225
400°	175
350°	150
300°	125
250°	100
200°	75

The number of practical applications possible by means of these space heaters is too large to catalog here. The Cutler-Hammer Manufacturing Company publishes a "Dictionary of Uses" which is a veritable mine of information regarding their use. The General Electric Company and the Westinghouse Electric & Manufacturing Company also issue some very interesting literature upon the same subject. Doubtless other manufacturers also are prepared to furnish authentic information and data upon the use of such heaters.



Page from recent catalog illustrating various uses for space heaters.

Better Merchandising

A Range a Day Is Charles Duncan's Way

Manager in Little Colorado Town Turns the Movies Into One of the Best Range Selling Stunts on Record and Achieves National Recognition

By Dell Deloe

ONCE in a while a real idea is born. Charlie Duncan, manager of the Arvada Electric Company, Arvada, Colo., is the progenitor of one of those rare ideas. It is the kind of idea that has sold an electric range a day for him for so long a time that to mention his name in Colorado is to stir up the discussion of his wonderful idea and of the ranges it has helped him sell.

The Arvada Electric Company isn't very big or widespread. It serves 860 residence consumers and serves them well. It needed the range load. The customers needed the ranges. Such were the ingredients placed in the hands of Charlie Duncan. Just what sort of a cake could he make of them?

The cake which Charlie Duncan managed to bake was that cake which is commonly referred to when the expression "takes the cake" is used. For what Charlie Duncan did with his 860 residential customers in the way of range sales will be written in range history. Already the Edison Electric Appliance Company has come to Mr. Duncan for a merchandising idea which it is exercising liberally in all parts of the country as a result of the success which attended its inception in Arvada, Colo., under the directing hand of Charlie Duncan.

From March 18 to April 29 he sold just 42 Hotpoint electric ranges. During the month of April alone, he sold an even 40, representing a value of between $6,000 and $7,000. And he's still going strong. He says he isn't going to give up until every home in Arvada is equipped with a range, and "mother comes out of the kitchen."

If live advertising, clever promotion plans and red hot sales stunts mean anything, then Charlie will do that very little thing.

Mr. Duncan has been in Arvada, a suburb of Denver, for 18 years, and with the Arvada Electric Company, as manager, 16 years. Ever since there has been a Hotpoint electric range to sell, he has been selling them.

For years his sales averaged about what one would expect in a town the size of Arvada, or a little better, for Charlie has always been a wide-awake salesman and manager. Then he got tired of just plugging along and selling

Can a cooking demonstration be so dramatically staged as to convince an entire city? Charlie Duncan seems to have found the answer.

an average amount of electrical appliances. He sat down and did some hard thinking. "This is an electrical age"—ran the thoughts—"everything is being done by electricity but half the women do not realize it. Or if they do realize it, they don't know how easy it is to equip their kitchens electrically and pay for it just as hubby does for his car—while they are using it. If they wait until they get $150 or $200 saved up in cash they will never get a range or an electric refrigerator."

He had had lots of good sales ideas before and made them pay. But they weren't just what was wanted now. He had been doing some clever advertising in the Arvada "Enterprise." Connecting up the idea of the electric range being the "Rolls Royce" of the kitchen, along with the suggestion that the perfection of the late model Hotpoint was on a parallel with "balloon tires, 4-wheel brakes, and over-head valves in a car,"

Charlie Duncan and his wife set off the posters on every company car.

made the citizens of Arvada sit up and take notice. As a result of this advertising sales began to improve. But improvement was not enough.

An Idea Is Born

"Every woman in Advada must own an electric range—mother's got to come out of the kitchen—she belongs at the movies." Charlie grabbed his hat and tore down the street to the Arvada theater. The big idea had hit him.

When he came away he wore a grin. He went over to the Arvada "Enterprise" and winked mysteriously at R. L. Gorrell, editor and publisher. Mr. Gorrell, who knows Charlie and has respect for his promotion plans went into secret conference with him.

The next evening the Arvada "Enterprise" carried an announcement that: "The Arvada Electrical Company is giving a free theater party." Every person in Arvada and outside it was invited to be the company's guest at a first showing of "Taxi! Taxi!"

"Honk, honk!" the advertisement read, "Step on the gas and get to the Arvada Theater March 18, at 2 o'clock, for the biggest joy ride you ever skidded into." And in black-face caps the advertisement informed the readers that "Ardell Crockett and Rosalie Duncan—two semi-pro stars—will put on a two-act stage playlet, featuring —**Mother Come Out of the Kitchen.**"

On Friday, March 18, the Arvada Theater, which seats 400 people, had inside it 600 people with more outside trying to get in.

When the curtain went up on the stage was a beautiful new electric range, with Miss Ardell Crockett, Edison Electric Appliance Company national demonstrator, busily going back and forth between range and Kelvinator, preparing dinner. A chicken ready for the oven stood on a white, porcelain-topped cooking table. Miss Crockett was whisking up a cake—when a stage door opened and in came Rosalie Duncan (wife of Charlie Duncan), the local demonstrator, as a "neighbor woman."

The neighbor registered surprise as she looked about the kitchen. Then a conversation somewhat as follows took place:

Neighbor: What's happened here? Brand new Hotpoint and a Kelvinator! Struck oil—or did Jim find a gold mine?

Mrs. Housewife: No, no—nothing of the kind (beating the cake dough vigorously), I've just been down to the Arvada Electrical store and talked to Charlie Duncan. The result—my kitchen is electrically equipped throughout. No more standing over red-hot coal stoves.

Neighbor: But—but—where—I don't see —My *dear*—the cost of all this—

Mrs. Housewife: I know what you are going to say. How can we afford it? Well, I couldn't afford *not* to afford it (emphatically pouring the batter into a cake tin). The other day I saw Jim looking at that snippy little widow, Lotta Pepp! Every one knows she spends a "lotta" time on her hands and face, and driving round in her car, looking pretty. Well—*I'm* going to have time from now on to spend on *my* face and hands. I'm going to get out of the kitchen—so I bought all this (gesturing with a doughy spoon) from the Arvada Electric Company and Charlie Duncan has given me easy terms on it.

The talk continued as the dinner, consisting of chicken, cake and vegetables was placed in the oven. During this convesation Mrs. Housewife was showing her visitor how easy it was to regulate the stove so that it would need no further attention while the dinner cooked.

Cooks Meal While Movie Plays

Then Mrs. Housewife and the neighbor woman went to the movies for the afternoon—down into the audience where they sat through the seven-reel picture. In the meantime, at one side of the curtain, in full view of the audience, stood the electric range, demonstrating "Rolls Royce efficiency" by cooking dinner while the mistress of the home was enjoying herself.

The picture over, Mrs. Housewife and the Neighbor Woman went "home"—back upon the stage, where they took the dinner from the oven. Everything was done to a turn—the chicken baked perfectly; cake, spinach roll, beets, peas, carrots, rolls, candied sweet potatoes—all cooked perfectly in the oven of the range at the same time. And not once did Mrs. Housewife have to peek in the oven! The dinner, just as it stood, was awarded to the lady who held the lucky number, each woman having been given a number when she entered the theater.

Did It Sell Ranges?

And the way that promotion idea went over! Charlie sold two Hotpoints that evening after the show. One woman was waiting for him on the steps of the theater and went with him over to the store.

"Send me this electric range the first thing in the morning," she said. "Here's where one more mother gets out of the kitchen."

But Charlie found himself in bad. He was like the man who prayed for rain but didn't have an umbrella when the cloudburst came. Charlie had only a few ranges on hand and they were gone before he knew it. Everyone was clamoring for ranges and there were none on hand to sell them! Charlie didn't pray for the rain to stop; he simply sent an S.O.S. for more ranges, then humped himself to find a place to store them.

His store holds about one range and a half, with barely room for a percolator

Arvada Electric Company

THEATER PARTY

The Arvada Electric Company will be hosts to their friends at the Showing of a Carl Laemmle 7-reel comedy special:

First Showing in Colorado

First Showing in Colorado

"HONK,HONK"—Step on the gas and get to the

Arvada Theater Friday, March 18

at 2:00 o'clock p. m for the biggest joy ride you ever skidded into!

ARDELL CROCKETT and ROSALIE DUNCAN

—two local serve-pro stars, will put on a two-act —stage presentation, featuring

"Mother, Come Out of the Kitchen"

400 LAUGHS ADMISSION FREE

Advertising the combined show and demonstration.

SIX CYLINDERS AND OVERHEAD VALVES
PURE JERSEY MILK, WITH THE CREAM LEFT IN—That's HOTPOINT
Hotpoint Electric Range
Kitchen Tested Before It Enters Your Home
Arvada Electric Co.
"Mother, Come Out of the Kitchen"
FAST AS A STRAIGHT EIGHT!
—that's Hotpoint!
Hotpoint Electric Range
"MOTHER CAME OUT OF THE KITCHEN"
Arvada Electric Co.

Typical advertisements. At left comparing the range to a high class car. At right the new style advertisement containing a local customer's name and business and signed by Mr. Duncan.

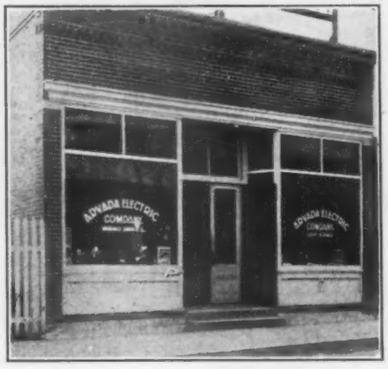
and a waffle iron on the side, so he stacked ranges one on top of the other in his tiny wareroom at the back until they reached the roof—they spilled over into the front store. The office girl had to park her hat and coat and gum in the oven of a range—Charlie had used the only hook in the store to hang a percolator on. Then he went out and rented a garage in which to store more ranges. As fast as he filled up his small storage space he emptied it again.

It has been almost three months since Charlie Duncan staged that movie stunt and his sales are still holding up. But he was not going to run the risk of the interest dying down. Recently he put the show and demonstration on for a second time, resulting in increasing sales again. Charlie has reached the stage that if he doesn't sell a stove a day he goes home with a peeve. In all he has placed some 200 ranges in Arvada. Two hundred from 860 resident customers of Arvada leaves only a little over 600 customers left to buy ranges. But still the ranges are selling on an average of one a day.

Since "a range a day is Charlie Duncan's way," the owners of the Arvada Electric Company are preparing to meet the demand by building a new store which will have plenty of room for not only ranges but for refrigerators, washing machines, vacuum cleaners and other appliances. Mr. Duncan plans to start on electric washing machines next. If he does, every Arvada back yard will look like a flapping, animated advertisement for the cotton and woolen mills, his friends predict.

In an interview Charlie Duncan said of his advertising: "The enjoyment I get out of putting over a stunt like that is more to me than any amount of money. I like to feel I've hit on a live-wire ad—there's a lot of kick in it, especially in electrical goods. Get the personal touch into an ad if you want it to get across. An ad that jumps out and hits the reader between the eyes, that's the kind of copy to write. Then, too, hand someone a little bouquet along with the advertising, if you can. It's easy in a small town to get on friendly terms with each customer personally. For instance, this one"—he held out a half-page range advertisement.

At the bottom of it in small print and in parenthesis was this interesting information: "Mrs. Harvey Fulton will give you a permanent wave while the teakettle steams merrily away on her new Hotpoint electric range. Phone Advada 83-J for an appointment."



The little store of the Arvada Electric Company.

Then to show that Charlie has an eye open to all angles of his plan of advertising (he didn't dare show favoritism or partiality; in a small town it would prove fatal) he included this in his next copy: "If you are in need of really fresh eggs or milk, call Mrs. Steurle, phone Arvada 193-J, and she will deliver them to you at your door. SHE cooks on a Hotpoint and has plenty of time for this service."

That was diplomacy for you. His rural and his city customers were all shown the same courtesy and thoughtfulness. Charlie can't figure in mere dollars and cents the returns such ads will bring him. He has made those customers friends for life. They will buy electrical goods from him as long as they need electrical goods. He means more to them than just a saleman who wants to sell more goods than the other fellow. They feel a sort of personal pride and interest in Charlie's success as though they had been instrumental in helping him put it across. And they have!

Human interest, a personal appeal, ads with a "punch" to them—yes, all that and more—Charlie Duncan puts **himself** into this selling campaign. He sells himself first of all; the sale of the range comes later.

One of the most attractive advertisements Charlie carries now, and he carries a live one each week, is that featuring the Christmas savings club plan. For every dollar deposited by a customer towards the purchase of a Hotpoint range for Christmas, so that "mother can come out of the kiechen," the Arvada Electric Company will deposit a dollar. Dollar for dollar—and at Christmas time if the range isn't paid for, it goes into the home just the same and the balance can be taken care of in easy monthly payments.

There is still another feature which Charlie has added to his advertisements. Each advertisement is individualized by bearing a fac-simile of his signature.

The promotion idea of the movie stunt has never been put over before in connection with electrical goods. The idea has spread through various channels and the Denver dealers have been bombarded for information concerning the plan.

Mr. Duncan made a trip to Colorado Springs to a meeting of electrical men and was called upon to tell of the plan before the convention.

Many companies in the West and all parts of the United States have been staging similar demonstrations with highly satisfactory results. Its a good idea for any city, but to the electrical dealer in a small town it can be made a gold mine, if the dealer will do as Charlie Duncan—work it hard.

Glacier Helps Make Refrigerator Sales

Boulder Office of Public Service Company of Colorado Associates City's Major Tourist Attraction with Electric Refrigerator Line

REFRIGERATION, whether natural or mechanical, is and should be an impressive subject in the city of Boulder, Colo., which prides itself on an adequate and satisfactory supply of both varieties.

Boulder's electric service is supplied by the Public Service Company of Colorado. The serving utility also provides mechanical refrigeration in the Kelvinator line and has outlined a vigorous campaign to acquaint its customers with Kelvinator products during the 1927 season.

Natural refrigeration at Boulder comes from the Arapahoe Glacier, largest in the state of Colorado, and tourist mecca for thousands during each succeeding summer. The glacier, nearly one mile square, and with an estimated depth of from 50 to 300 ft. of solid ice, is located only 25 miles west of the city at the crest of the continental divide in the Rocky Mountain range. As the prevailing wind direction is west, the Arapahoe glacier serves as a perpetual cooling plant for Boulder, which boasts of even tempered days and nights of invigorating coolness through the hottest summer seasons.

As a consequence of widespread familiarity with the glacier country and its cooling attributes, the idea was effectively used by the Public Service Company at Boulder in designing a refrigerator window display.

A large stage curtain drop upon which was painted an exact reproduction of the glacier, was used as a background for a showing of refrigerator models, with informative window cards to convey the suggestion of comparable refrigeration and coolness. Midway between the North and South Arapahoe peaks, which bulwark the glacier near Boulder, the artist painted a Kelvinator model and genuine cabinets completed the layout.

An additional feature of the window was the use of a standard copper coil wound to form the name "Kelvinator" and connected to one of the refrigerating units inside the window. The coil frosted to a thickness of nearly one-half

inch and was an attention-getting detail of the display.

Boulder has for a number of years been advertising the Arapahoe and several nearby glaciers as tourist attractions. Metropolitan newspapers in the middle and southwest territory of the United States have carried display advertising. Copy for this newspaper display space has continuously featured the glacier region, and the city has adopted the title "Gateway to the Glaciers."

Thus, when the utility sales department associated the popular glacier idea with a display of modern electric refrigeration, the window story struck a welcome chord.

The window idea and design originated with E. M. Rowland, district sales manager, and E. K. Hartzell, of the company's advertising staff. It was installed by G. A. Pratt of the local sales force, in charge of floor display and sales.

Glacier and electric refrigeration brought together in unusual window display.

N.E.L.A. Sets Utility Merchandising Standards

Policies Outlined by Merchandising Committee for Central Station Selling Methods and Trade Relations Situation

SIX RULES for the guidance of central stations in merchandising policy have been set forth by the merchandising committee of the National Electric Light Association under the leadership of C. E. Greenwood of Boston. The rules are set down to determine definitely the status of central station merchandising with respect to the other branches of the industry and relate themselves to development of load, list prices, giving of premiums, deferred payments, non-electrical merchandise, and co-operation with the trade in campaigns.

The six rules and their accompanying considerations follow:

1. The primary function of the central-station merchandising department is to increase earnings through load building, but it is likewise essential that profit be obtained through merchandising operation on cost principles.

It must be recognized that the central-station company bears development expenses which are especially not shared by the non-electric dealer who sells primarily the electric articles having public acceptance. Pioneering is expensive and rapidly absorbs profits from the best sellers. It is usually the promotion expenses through which all the trade benefits that make the difference between profit and loss on the central-station merchandising statement. There is a normal cost for securing all business of the power companies, and the cost per kilowatt added to the lines from the merchandising branch is always low as compared with the cost of building the light and power load which is generally recognized as an obvious and legitimate expense.

2. List prices should be maintained, when established and published as the standard selling price by the manufacturer.

When national activity and volume selling is contemplated and the net price to be paid by the public is to be lowered by manufacturer consent, through premiums or allowances, we recommend:

(a) If the selling plan originates with the manufacturer, that the manufacturer make adjustment of discount to the dealer during the period of the sale to make possible similar action by the dealer.

(b) If the plan originates with the central-station merchant, it is suggested that the local dealers be invited to tie in during the period of the sale on advantageous terms.

Appliance Campaigns

A schedule of concurrent campaigns for the sale of electrical appliances has been announced by the Commercial Section of the National Electric Light Association and has been adopted in co-operation with the manufacturers of the electrical appliances. This means that national advertising will be carried on by all national manufacturers during these same periods and the months listed below will be those in which to concentrate attention upon the particular appliance to be featured. The list follows:

Months	*Appliances Featured*
October	Electric heaters
November-December	Christmas gifts, electrical
February	Waffle irons
March	Toasters
April	Percolators

Manufacturers of electrical appliances are making available literature and sales helps in conformity with this program as announced.

3. The giving of premiums as an occasional stimulus to business is a long-established custom, and its value is measured by results obtained locally through this practice in merchandising.

It is of primary importance that when premiums are used the customary value of the article as designated by the manufacturer should be used in advertising. Misleading advertising is obviously not to be recognized by the central-station company. We believe the best interests of the company will be served when sales with premiums are on a co-operative basis with the local trade.

4. Deferred payments are now established practice and receive the support of leading financial men. The abuse of practice is evident in our industry and we suggest a return to sound economic terms.

The "dollar-down-and-a-dollar-a-month" practice is uneconomical perhaps, but it had its origin in the central-station effort to sell high-grade appliances at higher prices against department-store anid drug-store products and prices. We must bear in mind that a mass of our electric consumers have low earning power and limited budget to invest in appliances, and unusual terms are sometimes justified. However, extraordinary inducement in terms should not be offered except:

(a) Where no other dealers are in the local field to be affected, and

(b) Where local dealers are effectively tied in to the selling campaign in which unusual terms are offered and the central-station company carries the account.

We suggest twelve to fifteen months' limit for financing, with the exception of appliances in the stage of market development. We believe that, with the exception previously noted, the point of the hardware association is well taken in the suggestion of $15 as the minimum price for offering installments and a ninety-day limit on such payments. Initial payments on merchandise, with few exceptions, should be a minimum of 10 per cent. Substantial initial payments should be encouraged. In all cases a carrying charge should be made commensurate with the cost of rendering the service.

5. Non-electric merchandise should be sold with careful limitations.

The lines of electric merchandise are limited, and this adversely affects the attendance at the electric shop. The addition of kindred lines is justified to a degree, especially when sold in conjunction with electrical appliances. The practice of selling other than electric lines should be adopted only after effort is made to broaden the electric lines carried to the fullest extent. The electric department store possesses many advantages to the central-station company over the strictly electric novelty shop or store.

6. Whatever is in the public interest in our central-station merchandising practice should prevail.

We suggest that the electric and non-electric trade get together locally for common understanding and actively co-operate for merchandising in the public interest. Where leagues are established, the non-electric trade can be invited to join, or direct contact be made with other merchants selling electric devices. We have solicited our customers to join with us in ownership of the company; why not solicit our commercial customers to aid us in the marketing of electric service?

Direct Mail for the Home Builder

Well Prepared Booklet Stimulates Interest in Home Electrification and Serves as Entering Wedge

H. H. WALKER, pioneer electragist of Los Angeles, Calif., whose imposing three-story structure is an artistic asset to Venice Boulevard, recently decided to create a retail merchandising department as an adjunct to his already large business throughout the city.

To this end he took on national lines for various kinds of equipment, then looked around for a medium with which to publicize his new venture. As he is primarily known as an electrical contractor and engineer, and has, in the past, dealt chiefly with builders and architects, he sought some distinctive manner in which he could reach this limited audience.

Direct mail was finally decided upon, and this was narrowed down specifically to a twenty-page booklet, including the colored cover.

Under a Red Seal emblem the message begins: "H. H. Walker is collaborating with the California Electrical Bureau in its efforts to acquaint home builders with the advantages of electricity. Homes built to H. H. Walker electrical specifications qualify for "Red Seal" Certificates—an assurance of complete comfort and enhanced re-sale value."

Fred Ayres, sales manager of the firm, explained that this page was left practically blank to enhance the right-hand page, which carries the introduction to the booklet, signed by H. H. Walker. This introduction, about three hundred words in length, calls attention to the difference in the home of 1926 and that of 1906. Mention is made of the various recent additions to the growing list of household electrical appliances.

The balance of the booklet follows the plan of having a descriptive story on some one electrical appliance on the right-hand page, which is balanced on the left-hand page by an advertisement exploiting a specific nationally advertised electrical device, tying in with the description on the opposite page.

"The appliances so described were placed in the booklet according to their present importance or interest to those reading the booklet," explained Mr. Ayres. "For instance, we placed the Copeland electrical refrigerator first, because this is commanding the most attention right now. Then comes electrical cookery, followed by electrical air heating, and next to the last, the all-electrical home. Here is reproduced on one page a wiring plan for an all-electrical home. Radio comes last, not because it is the oldest in point of years, but because it had already been thoroughly sold to the public. The last printed page is laid out in ad form, and captioned: "Nothing Takes the Place of Experience." This is a brief sales talk on the reputation and integrity of the H. H. Walker firm, its standing in the community and its ability to do satisfactory work. At the bottom of the page is a reproduction of the three-story home of the firm.

The booklet, which was 6 x 9 in. in size, was mailed out in an envelope that did not necessitate folding. The only printing on the envelope was the address of the firm on the back flap, and the wording: "Your All-Electrical Home" in the upper left-hand corner of the envelope on the same side as the recipient's address.

"The use of 'your' on the envelope served to make the booklet a personal matter with the person receiving it," said Mr. Ayres. He stated that 5,000 booklets were published at an expense of 37½ cents each. Future editions, of course, will cost much less.

"We mailed these booklets out to a select list," declared Mr. Ayres. "They went to home owners, builders and architects. Many were firms we had been doing business with for years. Others were new to us. We obtained most of the names out of local trade publications, getting the information out of lists of buildings being planned, building permits issued and proposals. We were governed largely in our mailings by the price of the structures. We followed this up by telephoning and trying to make a date. Sometimes we did, sometimes de didn't, but on the whole, the booklet has proved an admirable entering wedge to new business, and a constant reminder to old customers that we have a complete line of nationally advertised electrical appliances and devices for the all-electrical home."

Cover design of the Walker booklet on home electrification.

Oversell Range Quota in Spokane Campaign.—Working against a quota of 325 ranges, The Washington Water Power Company, Spokane, disposed of 462 electric ranges in a six-week campaign through the territory served ending in May, including one contract for 44 ranges for a new Spokane apartment house. The campaign brought the total ranges on the system of the company to 8,673, according to Lewis A Lewis, sales manager.

Ten Tips to Fixture Salesmen

Portland Firm Describes Successful Methods for Selling Fixtures to the Average Home

1. Get the co-operation of the builder. He constructs the vast majority of homes in the average city. Thirty-one builders in Portland turn over their business to the M. J. Walsh Company, many of them leaving it to their discretion as to what fixtures are proper and appropriate for that class of home. This confidence comes only through demonstrating the higher salability of homes with modern fixtures.

2. Take advantage of the advertising value of homes you wire. Every new home is potentially an exhibit home. People like to walk through it, particularly people who are contemplating building themselves. The M. J. Walsh Company lets them know the fixtures they are viewing come from its store by means of a neatly lettered card placed on the mantel piece. Inquiries come in every day from people who state that they saw the firm had handled the fixtures in that new house on "Grand Street" or some such place. Make every home a Home Electric.

3. Follow up building permits. These are listed each day and turned over to the salesman thirty days later. He likes to get around to see the builder first and then into the house about the time the interior is being roughed in. Here he attaches a paper lantern bearing the firm name to the wires at the center outlet and on the side brackets of the living room he hangs a tag bearing his own name and stating that he has checked over the house and has suggestions for fixtures if the owner will call him up. His own personal name is given and his home phone, as well as the number of the firm. As a result of finding this tag, the prospect frequently calls up, curious to know what he has to suggest. If not, he calls himself, probably first on the husband, then makes an appointment with the wife. This call is to make an appointment for a later meeting at the store to go over his suggestions.

NEW LAURELHURST HOME
Open for Your Inspection
ALL DAY TODAY
and
MONDAY & TUESDAY EVENINGS
Located at 1191 E. Oak St.
One Half Block East of Laurelhurst Park
REIMERS & JOLIVETTE
Owners & Builders
435 Railway Exchange Bldg. BR 8791

Advertisement of new homes built, carrying the fixture dealer's name.

Tag placed in new homes to indicate that a study of fixture needs for the house has been made and may be obtained from the salesman.

4. Off-hour appointments bring best results. The purpose of giving the home phone is to encourage the man and wife to call up when they are together in the evening. When appointments are made in the store an effort is made to time these for the evening hours. There is less distraction then and less temptation for the prospect to say, "We would like to look further first but will come back later in the day." There is no other appointment awaiting them and they can take their time to decide. Evening appointments result in 100 per cent sales.

5. Give every salesman a district and turn over to him all prospects in that field. In this way he gets to know his territory and the class of fixtures the prospect is likely to see in the homes about him and consequently with which the salesman must compete. Moreover, he builds up a personal clientele who are glad to have people

M. J. WALSH ELECTRIC CO.
For over Thirty Years we have Designed and Manufactured
LIGHTING FIXTURES
For Service, Variety and Value
TELEPHONE BROADWAY 5781
106 4th STREET BETWEEN WASHINGTON AND STARK

Lantern hung to ceiling outlet wires of new homes at roughed-in stage.

referred to them and who speak well of his work when appealed to by their friends. If he can say, "I sold the fixtures for that house across the street," or, "Do you know the Browns? I know Mr. Brown personally—you see, I put in the fixtures in their home," his task is halfway accomplished. There are five salesmen with the M. J. Walsh Company, one of whom has been with the company for 23 years, one for 16, one for 5 and so on. They are as well known in their respective territories as is the store itself.

6. Do not be afraid to go after the small home—it pays. The average cost of the homes for which fixtures are supplied by the M. J. Walsh Company is in the neighborhood of $5,000. One salesman has a territory where the homes average $3,000 and the fixture sales $38, yet he makes money on a straight commission basis. The firm recommends an expenditure for fixtures by the customer on about the following ratio:

For homes up to $5,000 1 per cent of the cost.

Mantlepiece card placed in new houses while being inspected by the public.

From $5,000 to $7,500, 1½ per cent of the cost.

From $7,500 to $10,000, 2 per cent of the cost.

$10,000 and up, 3 per cent of the cost.

7. The salesman should count on making from eight to nine calls a day. Experience of the Walsh Company indicates that an expert salesman will net about 65 per cent sales or from five to six jobs a day.

8. Keep on friendly terms with the architect. He often is the deciding factor in a sale. In expensive homes he frequently makes the selection personally. In many cases a suggestion that the decision be referred to him will result in the choice of a better type of fixture.

9. Make out a tentative layout for the job before talking to the prospect at all. It pleases the customer to think you have taken that much interest in the work and gives you a start over the salesman who makes the approach without having personally inspected the job.

10. It is just as bad to show too expensive a line for the job in question as it is one that is too cheap. The prospect has a definite allowance set aside for fixtures in most cases and showing him equipment which is too high for his purse merely makes him dissatisfied with what he can afford when he does see it. To sell fixtures which will be inadequate for the need of the householder and which will look cheap in their intended surroundings, on the other hand, means not only a loss on the sale in question, but also poor advertising of the firm to all who see the job.

"Better Homes" and the Red Seal

Exhibit at San Diego Exposition Stirs Interest in Better Home Wiring

THE better homes movement sponsored by architects and builders offers many an opportunity for the presentation of the Red Seal idea. To capitalize upon a recent Better Homes Exposition held in the county building, Balboa Park, San Diego, from May 9 to 14, George N. Rankin, field representative of the California Electrical Bureau for southern California in cooperation with the San Diego Consolidated Gas & Electric Company, conducted a booth from which to contact those who visited the exposition.

The booth was very simply arranged. At the rear was a large poster containing the typical floor plan used by the California Electrical Bureau, at each side of which was placed the Red Seal emblem. Above and below the floor plan respectively were the words, "Is your home adequately wired?" "Can you use any appliance conveniently?"

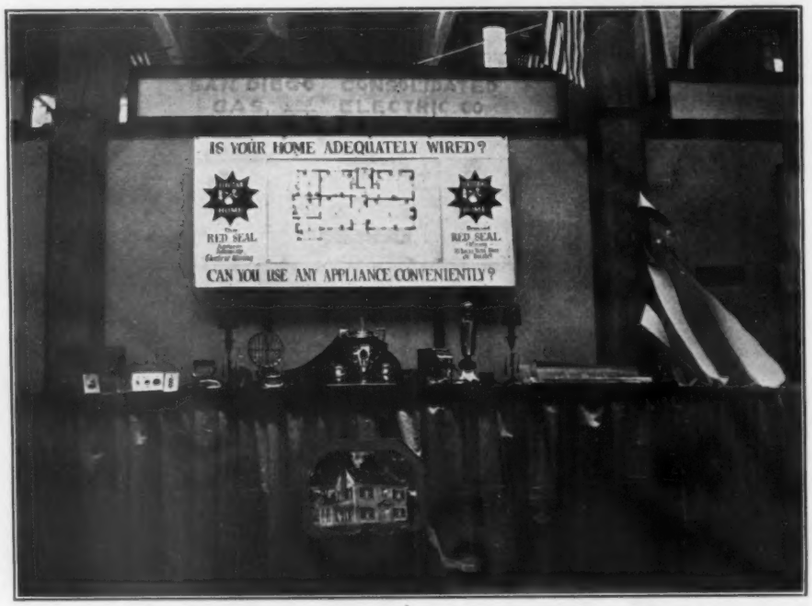
Below the poster was placed a shelf upon which the various appliances common to the home were arranged. A number of blue prints of home plans also were available to the representative who stayed in the booth and explained to visitors the purpose of the exhibit.

The booth received a great deal of attention from all who attended but the real good was accomplished with those who actually came into the booth and asked questions. The number of such visitors was tabulated and a total of 480 were actually contacted during the week, not including those who just stopped and took a folder or who merely looked over the appliances on display. The 480 is the figure as to the actual number to whom the Red Seal story was given. Among these were a number of builders, architects and designers, but the greater proportion were those who are preparing to build homes of their own in the near future. Many of these took copies of the wiring plan and specification sheet with them when they left.

The figures did not include those in the employ of the power company or of other exhibitors in the building, which would bring the number of visitors to a probable 100 extra. A class of domestic science students in one of the high schools also came to visit the booth. The entire class was told the Red Seal story by the teacher to whom Mr. Rankin had previously given the same information. This class of girls, potential customers of tomorrow, was given a talk upon the advantages of having a home properly wired, not by the Red Seal man but by the teacher of their own class, a fact which should strengthen the impression made at that time.

Following the exhibit a large copy of the wiring plan was furnished to K. S. Scott, electrical instructor at one of the junior high schools, and H. F. Davis a designer with a real estate concern in San Diego. The plan used was one that had been traced from the Red Seal literature and enlarged by H. Dillon of the San Diego utility.

While it is not felt that the results are particularly spectacular they point the way to an opportunity for presenting the message of better wired homes in a manner and at a time which is most acceptable to the prospect.



Simple yet effective display booth for the Red Seal Plan at the "Better Homes" Exposition in San Diego recently.

Getting Those Overdue Accounts Paid Up

A Gentle But Firm Method to Separate the "Slow-Pays" from the "Dead Beats" and Collect Without Losing Good Will

IS IT possible to reduce the loss from bad accounts to an absolute minimum? When this question was put up squarely to a successful electrical contractor-dealer recently, the answer was, "Yes, if you use the right amount of persistence,, continuity and insistence, tempered with mild-scented tact. This reduced to a more commonplace formula means:

1. The collection methods must bring home the bacon, without resorting to legal action and unnecessary expense, and without leaving a bad taste in the customer's mouth as a result of your extractions.

2. The campaign must be waged consistently and persistently from the "drop of the hat" and yet so adroitly handled that the debtor will not be offended but will become a good-pay account afterward.

3. The moment the account becomes overdue it must be set aside for special attention and then followed up regularly at five and ten-day intervals.

"This prescription generally cures. It must be compounded in true pharmaceutical style, however, certain very important ingredients accompanying the mixture.

"The trouble with most men is that they have vinegar in their veins. They can't distinguish between 'slow-pays' and 'dead-beats', so they apply one remedy as a cure-all. My method sifts the 'dead-beats' from the 'slow-pays' by a gradual weeding out process.

Never Let an Account Grow Whiskers

"I never let an account grow whiskers on it. While slow-pays must be brought to time and dead-beats quickly spotted and severely dealt with, it is not a good plan to relegate every overdue account to the dead-beat class, or to send each and all of the delinquent accounts a 'humdinger' of a collection letter. Those who have sufficient honesty will pay their bills eventually. All you have to do is to keep after them continually in a friendly vein until they are paid up in full.

"Slow-pays have potential sales possibilities for the future. There is no use scratching them from the ledger simply because they don't pay promptly. There may be some reasonable excuse. So I find out first if there is. It costs something to get good customers on the books, so I keep them there until I am satisfied they are no longer entitled to credit.

"If I can get them to explain their delinquency I've got a strangle-hold on their business and I maintain their friendship. I get the money eventually, if not sooner than I would otherwise. And by keeping constantly after overdue accounts and handling them so adroitly that they cannot take offense, they will not only pay up but become good customers afterwards. It is human nature to pay your more insistent but more tactful creditors first."

Diplomacy, if it is ever needed, is needed badly when accounts are overdue. This article tells how to apply diplomacy to the hard job of collecting.

The plan which this electrical contractor-dealer uses in discovering the slow-pay and dead-beat accounts is as simple as it is effective. Just as soon as an account becomes delinquent the monthly statement is made out on yellow duplicates and the extra copies placed in a follow-up jacket for consecutive attention. Every ten days after the original statement is mailed, out goes one of the duplicate statements with a sticker attached, until four have been mailed. Then follow three letters. The net result of this campaign is a general clean-up with but few accounts left over for suit or the profit and loss account.

Stickers and Letters Get Results

Gummed stickers are used, printed in red, on a white background, with a heavy blue border. All letters are typewritten because it has been found that slow-pays are used to printed form letters and seldom pay any attention to them.

Any one of this chain of go-getters can be counted on to bring in results. As the chain progresses the follow-up jacket becomes gradually unburdened of unpaid accounts. It is very seldom that the last letter of the series has to be mailed. But when it comes down to that it shows the dead-beat up, while the slow-pay has come across either with a check or a perfectly satisfactory explanation.

First Sticker.	**PLEASE TAKE NOTICE** That this account is now being carried on our books as **not paid on due date.** Can't you send a check by return mail, or at least **explain when we may expect payment?**
Second Sticker.	**WE HAVE BEEN WAITING** Most patiently—to receive your check, **now overdue.** Won't you please **mail it to us immediately** or explain why you are not making your usual prompt settlement and thus maintaining your reputation for **prompt pay?**
Third Sticker.	**YOU HAVE FAILED** To pay your account promptly, and we're growing more impatient **over your unexplained delay.** Why haven't we heard from you? Please don't keep us waiting any longer, but **send your check in today in the enclosed envelope.**
Fourth Sticker.	**SAY!** If you don't pay this account soon whiskers will start growing on it! You've got a check handy right now, so here's the magic pin. **Get Busy Please!** (A pin is stuck into the bill through the sticker.)

The remainder of the accounts which fail to respond to stickers are now appealed to in the form of personally typewritten letters, mailed at ten-day intervals:

First Letter

"We don't know whether you have been sick, absent on an extended vacation trip, or whether you have just plumb forgotten all about that little bill of ours for $.....

"Now, if you will just write us your check for all the bills we have been sending you, we will call it square at $..... (naming the amount actually due) without interest.

"That's fair enough, isn't it? And that will not only put you completely at ease, but it will also put us out of our misery! What do you say?"

Second Letter

"Say! It's some job to write two good sales-collection letters in a row! It is a trying thing to have to sit down to write you a letter which will not only bring home the bacon, but also keep you in friendly good humor.

"But, imagine my chagrin at not receiving your check promptly after I sent you the last letter! I thought surely it would bring you back—back into the fold for more business, **plus a check.** But you failed me completely.

"Now, please don't disappoint me again! You can save us both untold embarrassment by **sending in that check today.** End my suspense now—don't wait again until tomorrow, and then watch me smile all over, for my faith in you will be well founded. It's your move!"

Third Letter

"Well, it's happened! You've done it now!

"You have failed to answer my friendly summons and now it is going to be necessary for me to resort to a legal summons. You have not called me up, written me about your account, or come in to ask for an extension.

"But I have a certain way of judging people, and my judgment of you is that you're **Square**—with a big capital "S", and I'm just going to hang on to that opinion until Friday the Thirteenth. If you don't send in your check by that time—well, you know the rest. It's up to you now!"

Needless to say, this ends it. For if the customer does not come into explain his delinquency or to make a partial payment, it is time to sue or charge off the account to profit and loss. Thus the scheme automatically separates the dead-beats from the slow-pays.

Gets Under the Skin

Notice how the first letter opens the way for excuses of the most natural kind, yet in a jocular way gets under the debtor's hide. Note how the closing words make for action of the right kind and get a laugh, even from the most hardened slow-pay.

Observe how the second letter opens up with an appeal, plays upon the emotions, and finally closes with a psychological twist which compels action. Throughout there is a spirit of friendly compulsion, yet soothing—nothing to ruffle the temper, under the urge of sending that check today.

Note how adroitly the third letter swings the noose, yet there is the entire absence of any direct threats—they are all veiled and sugar-coated, yet they mean business, and the recipient knows it only too well. Hence, it begets final action.

By getting under the skin of the debtor in this friendly but insistent way, results are inevitable.

News of the Industry

Los Angeles Moves to Enjoin Gas and Electric Company

A resolution recently was adopted by the city council of Los Angeles, authorizing the city attorney to initiate injunction proceedings against the Los Angeles Gas & Electric Corporation to prohibit it from using the city streets to supply electrical energy for any purpose other than that of illumination. The resolution set forth that the company had never complied with the law requiring it to obtain a franchise from the city for the distribution of electrical energy for power and heating purposes and that it is operating in Los Angeles under a blanket franchise granted by the constitution of the State of California for the purpose of distributing electricity for illumination purposes only.

The council declared that because the company has no franchise to deliver energy for power and heating purposes to its consumers its operation in city streets and the construction of pole lines and underground conduits to compete with the municipally owned power and light utility is unlawful.

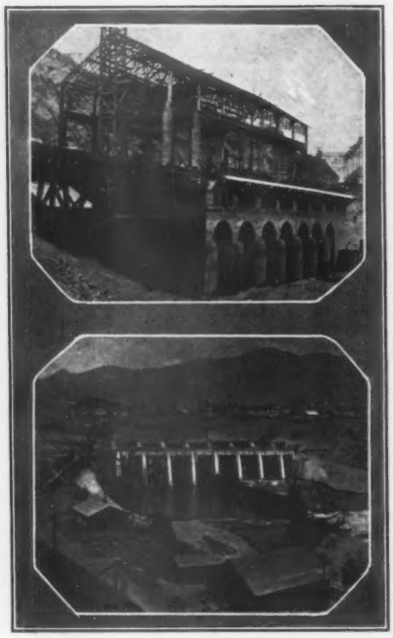
The resolution was adopted by the outgoing city council, and the action followed closely upon the recent bond election at which was defeated the proposed measure for appropriation of funds to evaluate the properties of the Los Angeles Gas & Electric Corporation with a view to their acquisition by the city.

Operation of First Chelan Unit Planned for August

Construction and erection work on the Chelan hydroelectric project of The Washington Water Power Company had reached the stage on June 15 that plans were under way for placing the first unit of 32,000 hp. in operation late in August. Dam, tunnel and power house, as well as switching and transformer yard, are being brought toward the point of completion simultaneously.

Already the eight bays of the gravity-type diversion dam are in place and the intake tubes are being constructed at the south end of the structure. The dam has an intake section of 184 ft. and spillway section of 316 ft. The structure will be 39 ft. high from river bed to operating platform. Tainter type gates 20 ft. wide and 14 ft. high will be used. Intakes are provided for the present tunnel, 14 ft. in diameter, and a future tunnel to be 17 ft. in diameter. Gathering tubes are of the Wahlman design and patent.

The main concrete-lined tunnel will be 10,480 ft. in length, with a gradient of 3.14 ft. per thousand. Steel penstock begins a short distance above the riser to the surge tank, extending 986 ft. to a wye, with branches 116 ft. long to water wheels for the first two units. The plant has a head of 400 ft.



Above—The Chelan power house on the west bank of the Chelan River just above the point where it joins the Columbia River. The building, of the Italian Renaissance period, is of vari-colored brick, with substructure of concrete and roof of red tile. Below—The main spillway section of the gravity-type diversion dam is about completed. The dam is approximately 500 ft. long and rises 35 ft. above the river bed.

The first two units, one to be installed at present and a second in 1928, include 30,000 kva., 300-r.p.m., 11-kv., 3-phase, 60-cycle, vertical-shaft generators, each direct-connected to a 140-kw. 250-shunt-wound exciter with interpoles. A spare motor-generator set may be used to excite any unit.

Power from the first Chelan unit will be transmitted to the general system of The Washington Water Power Company over the present 110-kv. line from Chelan to Coulee City and east, and over a 60-kv. line north to the Okanogan Valley district.

Excavation work began on the Chelan project in April, 1927, and the tunnel, slightly over two miles long, was excavated in about six months. The construction contract is held by Grant Smith & Company.

Edison Co. vs. Water Bureau Hearing Set for Aug. 11

Aug. 11 has been set by Judge Shaw of the Superior Court as the date for the hearing of the application of the Southern California Edison Company for a permanent injunction against the Los Angeles Bureau of Power and Light to prevent its building a steam plant.

At a hearing held before Judge Shaw on June 28 attorneys for the Power Bureau argued that the bureau had the right to spend its funds as it deemed fit and that the people had nothing to say as to how the bureau should spend its earnings, according to press dispatches from Los Angeles. They urged the court to dismiss the temporary injunction which Judge Shaw had issued Jan. 15 in the suit brought by the Southern California Edison Company as a taxpayer against the Water and Power Commissioners to prevent the expenditure of public funds in building a steam plant at the harbor of Los Angeles. (Electrical West February issue, p. 108.) Judge Shaw refused to dismiss the temporary injunction.

Reports from Los Angeles state that attorneys for the Power Bureau admitted that the bureau intended to go ahead at once and spend $3,250,000 for a steam plant. It is estimated that the site of the plant will cost an additional $2,000,000 or $2,500,000. The trial on Aug. 11 is expected to bring forth just how the bureau will finance the plant and acquire the site on which it is to be built.

The Edison compay contends that in the budget for the $16,000,000 power bond issue of 1925 and the $11,000,000 power bond issue of 1926 there were no items for a steam plant, and that, therefore, the bureau is morally bound, at least, to the people of Los Angeles to use bond funds only for the usual and necessary extensions to its system. The Edison company also claims that the plant is not needed; that its construction would be illegal and a waste of public funds; that its operation would be a violation of the contract, made at the time the Edison distribution system was sold to the city, that provides that the city will purchase from the Edison company until 1932 all electricity needed in addition to that generated by the city's own plants on the acqueduct, and that the Edison company has a 300-hp. steam plant in operation and at the service of the Power Bureau.

At a special election June 7 a proposed measure authorizing the bureau to lease harbor lands as a site for a standby steam plant met with decisive defeat.

Purchase of Byllesby Companies Approved by Commission

Purchase by the Pacific Gas and Electric Company from the Standard Gas and Electric Company, the holding company of H. M. Byllesby & Company, Chicago, of the Western States Gas & Electric Company, the Sierra & San Francisco Power Company, and the Coast Valleys Gas & Electric Company, has been authorized by the California Railroad Commission.

By the terms of the agreement, full details of which were published in the June 1 issue of Electrical West, page 486, the Pacific Gas and Electric Company will issue to the Standard Gas & Electric Co. 260,000 shares of its common stock of a total par value of $6,500,000; and $2,085,000 in cash, for stock of a total par value of $27,029,700 of the companies named, and all rights and properties of a power project on the South and Middle Forks of the Feather River, of which the Bean Creek project is a part, subject to all obligations as of May 1, 1927.

It is stated that the change in ownership will bring about no immediate change in the status of the several corporations or any change in contractual or other obligations, except that the contract under which the Byllesby Engineering & Management Corporation of Chicago now supervises the engineering and operation of the other companies named will be canceled, and such supervision will be exercised directly by the Pacific Gas and Electric Company through its existing organization.

The three public utility companies, whose control Pacific Gas and Electric Company is acquiring, had a gross operating revenue of $7,720,987 for the twelve months ending March 31, 1927. There remains a balance of $255,887.69 available for dividends on common stock after payment of operating expenses, interest, other fixed charges and dividends on outsanding preferred stock.

Edison Company Orders Three 50,000-kva. Condensers

Order has been placed by the Southern California Edison Company with the General Electric Company for three very large synchronous condensers to be used to regulate the voltage of the transmission lines which carry power from the Edison company's Big Creek hydroelectric development into Los Angeles. The condensers each are rated at 50,000 kva. and will operate at 13.2 kv. Each condenser with its exciter weighs 375,000 lb. and the overall dimensions are: length, 26½ ft., width, 16 ft., height above bottom of base, 12 ft. Two of these condensers are to be installed in the new Lighthipe substation and one will be placed in Eagle Rock substation.

Condensers having a capacity of 30,000 kva. each, the largest previously made by the General Electric Company, now are being used by the Edison company in its Laguna Bell and Eagle Rock substations.

Members of California Colorado River Commission Named

Members of the California Colorado River Commission recently authorized by the state legislature have been appointed by Gov. C. C. Young of California. They are John L. Bacon, former mayor of San Diego and president of the Boulder Canyon Dam Association; W. B. Matthews, special counsel of the Los Angeles Board of Water and Power Commissioners; and Earl C. Pound, president of the board of directors of the Imperial Irrigation District, Imperial Valley.

According to the provisions of the lesgislative act creating the commission, it will be the duty of its members to confer with official representatives of the other Colorado River Basin states involved in the proposed Boulder Dam legislation, with a view to uniting all factions.

Utah Governor to Call Conference of Seven States in Colorado River Basin

A conference between the seven Colorado River basin states for the purpose of discussing water rights, the Boulder Canyon dam project and other angles of the Colorado River situation will be called by Governor George H. Dern of Utah. The conference probably will be held in August and in Salt Lake City, according to an announcement made by Governor Dern July 14 while on a visit to San Francisco. The governors of Wyoming, Colorado and New Mexico will join with Governor Dern in issuing the call for the conference.

The proposed gathering is the result of a series of conferences which the Colorado River Commission of Arizona held recently with Governor Adams of Colorado at Denver, Governor Emerson of Wyoming at Cheyenne and Governor Dern at Salt Lake and with other officials of those states. A conference also was held by the Colorado River Commission of California with Governor Adams at Denver, and while in Sacramento Governor Dern conferred informally with Governor Young of California.

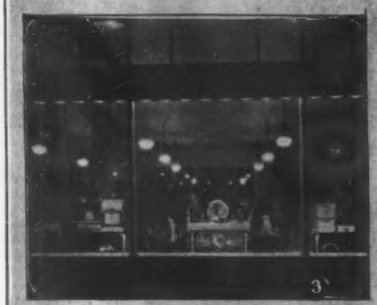
In his statement relative to the call to be issued Governor Dern said in part:

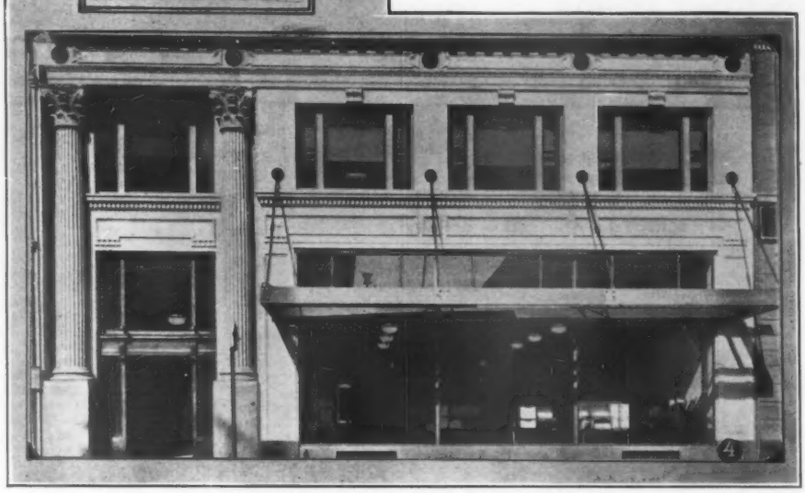
> Utah and the other upper tier states are in full sympathy with California's needs in connection with the Colorado River development, and any understanding to the contrary is without foundation. However, Utah feels that its own rights and the rights of the other upper tier states can be fully safeguarded without detriment to the interests of California, and we propose ironing out this situation at a conference . . .
>
> We are intent that the Swing-Johnson bill be based upon a seven-state ratification instead of the six-state pact at present existing, with California's signature to that having a string attached. Utah's position is that we are opposed to any development on the Colorado River until the Santa Fe pact is ratified by all seven states; therefore we have consistently opposed the Swing-Johnson bill.
>
> This six-state pact does not give us full protection for we cannot be fully protected so long as one state retains freedom of action. Moreover, if Congress can proceed with development under a six-state pact it also can proceed under a compact ratified by five or four or three, or it can proceed without any state ratification at all, so it will be purely a fiat of the federal government riding rough-shod over the inherent reserved rights of the states.
>
> We of the upper tier states are prepared to stand irrevocably on states rights. Utah contends it owns the bed of the Colorado River in Utah and it is an extremely valuable natural asset. The Swing-Johnson bill asserts government ownership of the river bed, which we deny, and Arizona takes the same stand.
>
> Our attitude toward government aid is that after the government has been repaid for its expenditure it withdraw all claim, just as would a banker withdraw all claim to security after the note has been paid. We also contend that allocation of the water is not the province of the federal government, but the province of the seven states in agreement reached between them.
>
> Full protection must include a declaration by the states and by Congress that Mexico can never acquire priorities on waters stored in works constructed in and by the United States.

Farmers' Complaints of Service to Be Investigated

In the interests of better electric service to agricultural consumers throughout California the Railroad Commission of that state has decided to appoint, after conference with representative agriculturists, two engineers whose duties will be to make investigation of all complaints of low-voltage or inadequate electric service. In making the announcement the commission stated in part:

> This action was taken by the commission in response to complaints from farmers and orchardists that during periods of heavy pumping during the summer irrigation season the power voltage would drop so low that their motors would be unable to pump sufficient water, and in many instances would "kick off." The farmers complained in a number of instances that they were subjected to a loss, due to failure of the power at the critical period of the irrigation season, and that they were being charged a higher installation charge for their electric services than the service could deliver, when the power is most needed.
>
> Inspections made in the past by engineers of the Gas and Electric Division of the Railroad Commission, showed that failure of the power is usually due to insufficient capacity of the feeder wire serving a number of consumers, or failure of the utility to maintain the station voltage. In some instances lowering of the water table has been responsible for conditions which complainants ascribed to power trouble.
>
> The engineers making these inspections were able to direct the necessary corrective measures to eliminate the trouble, and to insure an adequate supply of electricity at all times. In no case was the unsatisfactory condition due to an actual shortage of power on the part of the power company.
>
> In order to make the necessary inspections to render this new service of value to the farmers of the state the Railroad Commission found it necessary to obtain engineers who will devote all of their time to the work. It was found impossible to do it with the present force of the Gas and Electric Division, which is engaged in a large number of major proceedings.
>
> A great deal of preliminary exploration and inspection will be done during the present year, but it will probably be next year before the full benefits of this service can be given to the farmers of the state. It is hoped to eliminate many conditions of the nature complained of before the irrigation season begins next year, so that the trouble will not arise.





Coast Valleys Gas & Electric Company Opens New Offices to the Public

Approximately 2,000 people took advantage of the opportunity to inspect the new office building of the Coast Valleys Gas & Electric Company in Salinas that was formally opened to the public June 25.

The building, which formerly was occupied by a banking institution, has been almost entirely remodeled. The granite Corinthian columns of the old building have been retained, and stone cornices and roof balustrade have been carried across the rest of the front to conform architecturally. The outside entrance to the second story has been removed and a beautiful marble stairway installed inside the lobby. This is guarded by an ornamental iron grillwork railing of the Spanish type. Underneath is an arched alcove piped for gas, water and sewer connections and wired for electricity. This space may be used for demonstration of all types of modern gas and electric appliances and labor-saving devices. The spacious lobby on the first floor is finished in hit-and-miss cream-colored plaster with gray Tennessee marble wainscoat and pink Tennessee marble floor. This space, which is completely wired, will be used as display and demonstration room for ranges and other appliances. One corner of this lobby is occupied by the cashier's cages and service counter.

Immediately back of the lobby is the commerical department in charge of Phillip S. George, commercial manager and treasurer of the company, and in back of that department are two large rooms, one given over to the customers' billing department and the other to the stationery supply department and the addressograph department.

The general offices on the second floor include the executive offices of James F. Pollard, vice-president and general manager, the operating and engineering department in charge of T. W. Snell, general superintendent, and G. A. Peers, assistant superintendent, and the general accounting department in charge of E. N. Hoffman, chief auditor and secretary of the company, and his assistant, W. E. MacDonald. A private branch telephone exchange connecting all departments is also on the second floor.

Three large plate glass show windows, which give an unobstructed view of the interior, occupy the south 29-ft. of the first floor. Over these show windows there is a copper-clad marquee, on top of which is concealed a battery of floodlights which illuminate the entire front of the building.

At the formal opening the entire company pensonnel acted as members of a reception committee and as guides to escort visitors through the building and explain the operations of the various departments. Demonstrations of many of the appliances on display in the lobby were given. Music played in the lobby during the reception and the serving of refreshments were additional attractive features that added to the pleasure of the occasion.

JAMES F. POLLARD

In the illustrations are shown (1) a portion of the display space in the lobby with some of the numerous fioral tributes received by the company; (2) the artistic marble stairway with its Spanish-type grillwork rail that leads to the second story; (3) the large show windows with the display as it appeared on the opening day; and (4) an exterior view of the new headquarters.

The portrait is that of James F. Pollard, vice-president and general manager of the company, who has made a splendid record of achievement in the seven years in which the operations of the Coast Valleys Gas & Electric Company have been under his direction.

The engineering department has a complete equipment of blueprinting machinery with dark room, wash trays and machine for making prints directly from tracings.

Herminghaus-Edison Hearing Set by U.S. Supreme Court

October 3 has been set by the Supreme Court of the United States as the date for arguments in the case of the Herminghaus heirs vs. the Southern California Edison Company. Decision in the original suit was rendered by the superior court of California to the effect that the Southern California Edison Company might not impound the waters of the San Joaquin River and its tributaries to such an extent as to prevent the annual overflow of the river and the consequent inundation of the Herminghaus acreage. The company was enjoined from storing flood waters of the river in its Florence Lake reservoir in order that these waters might overflow the plantiffs' lands and so furnish the few acre-ft. of water necessary annually to irrigate them. The Edison company has contended that the method used by the plaintiffs was wasteful and that under the Water Commission Act the company had the right to impound water that otherwise for the most part would flow unused into the ocean. The supreme court of the state upheld the decision of the superior court, and the Edison company appealed to the Supreme Court of the United States to review the case. This the Supreme Court has decided to do, setting Oct. 3 for the hearing, but has declined to set aside the injunction granted by the California court.

Announcement has been made by the Edison company through Roy V. Reppy of its legal department that financial arrangements have been made by the company with the Herminghaus heirs for impounding this year's runoff from the San Joaquin River in the Florence Lake reservoir.

As a result of the decision rendered in the Herminghaus case, a constitutionai amendment, limiting riparian rights to a reasonable and beneficial use of the water was passed by both houses of the last California legislature and will be submitted to the voters of the state in November, 1928. (Electrical West, June 1, 1927, p. 489.)

Fiftieth Convention of N.E.L.A. Is Highly Successful

The fiftieth convention of the National Electric Light Association, held recently in Atlantic City, in which 8,000 men and women participated, was a great success. In addition to the members of the fraternity, many prominent speakers not directly connected with the electrical industry appeared on the program.

Expansion of service in its broadest aspects, the keynote of the convention, was emphasized by R. F. Pack, president of the association, in his opening address, in which he depicted the marvelous growth of the light and power industry and declared that the American people would not consent to its socialization in view of what had been accomplished during the last forty years under private operation. Many commercial problems were discussed, particular attention being paid to economic load-building and to the public relations aspect of merchandising. Progress in administration, equipment design, operation and utilization of resources was reported at the engineering session, while discussion at the public relations session centered about the topics of customer ownership, education of public opinion along sound lines, home economics, the work of women in this field, and the effect of sales activity upon popular friendship.

At the public policy session R. H. Ballard, vice-president and general manager, Southern California Edison Company, and chairman of the committee, in his report set forth the creed of the power industry, which included advocacy of the Federal Water-Power Act and of the wider practice of interconnection, belief in state regulation of electric rates and in the efficacy of private initiative and enterprise, and unalterable opposition to government ownership and operation or government participation in business enterprises. A feature of the session was the award of the Coffin Medal to the Edison Electric Illuminating Company of Boston for meritorious service.

The newly elected officers for the 1927-28 administration follow: president—H. T. Sands, Electric Bond & Share Company, New York; first vice-president—P. S. Arkwright, Georgia Railway & Power Company, Atlanta; second vice-president—J. B. Miller, Southern California Edison Company, Los Angeles; third vice-president— M. S. Sloan, Brooklyn Edison Company, Brooklyn, N. Y.; fourth vice-president —W. A. Jones, H. L. Doherty & Company, New York; treasurer—P. S. Young, Public Service Electric & Gas Company.

Utah Engineering Council Names Colorado River Committee

A special committee to investigate and report on the Colorado River project recently was appointed by the Engineering Council of Utah, according to press dispatches from Salt Lake. Leonard Cahoon, manager of the Stratton-Cahoon Company, and president of the Engineering Council, was selected as chairman.

In making the announcement of this appointment the committee made the following statement:

> The Council has ordered the survey with a view of being of service to the officials of the state in connection with the problem. The committee will have no other purpose than to ascertain the exact facts and discover how the interests of the state may be best served. Our organization will not take any part in the present controversy. There has been too much propaganda circulated regarding the project; it is our belief that it is time for competent people, with no axes to grind, to look into the matter and make public a report on exact conditions and what Utah's interests really are. Above all, it is our paramount desire to co-operate with officials of the state in every way.

California Oregon Company Changes Address.—The San Francisco office of The California Oregon Power Company has been removed to 58 Sutter Street, Room 707.

Court Rules City Plants Serving Beyond Limits Subject to Regulation

As long as municipal power plants in Oregon confine their activities within the city limits they properly may be exempt from the requirement of a certificate of public convenience and necessity from the Oregon Public Service Commission but when they extend their services beyond those limits they must obtain such certificate. That is the gist of an opinion recently rendered by an Oregon court in the case of the Yamhill Electric Company, Newberg, Ore., against the city of McMinnville.

The Yamhill Electric Company had brought suit against the city of McMinnville to enjoin it from serving a customer outside the city limits and within territory served by the Yamhill company. The city for some time has been serving customers in territory not receiving service, and when it attempted to extend its lines still further by entering the territory served by the Yamhill company it failed to apply for a certificate of convenience and necessity from the Public Service Commission, since under the Oregon law municipalities are not under the jurisdiction of the Public Service Commission and are not required to obtain a certificate of convenience and necessity.

The Oregon Public Service Commission was appealed to by the Yamhill company when the city attempted to enter the territory served by the company's lines, but the commission refused to act without a court decision. The Yamhill company then brought an injunction suit.

In rendering its decision the court pointed out that in its operations conducted outside of its limits the city of McMinnville had operated as a public utility; that the city charter, which gives the water and light commission authority to operate a power plant to furnish light and power to the citizens within the city of McMinnville and in the vicinity and to erect the necessary lines within the city limits, does not contemplate the city erecting or maintaining lines outside of the city limits; and that the city is exempt from coming under the rules and regulations of the Public Service Commission only when acting within its corporate boundary.

Organization Officials on Newly Organized S.E.D. Board

In the recent reorganization of The Society for Electrical Development, Inc. amendments to the by-laws were adopted making provision for membership on the board of directors of the society of the president, the chairman of the Commercial National Section, and the managing director, respectively, of the National Electric Light Association; the president, managing director and one other representative of the National Electrical Manufacturers' Association; the chairman of the executive committee, the managing director and one other representative of the Electrical Supply Jobbers' Association; the president, general manager and one other representative of the Association of Electragists, International; the chairman, the vice-chairman and one other representative of the League Council. These members of the board have been added to the original directorate.

The plan for an enlarged directorate was put into effect immediately by the appointment of R. F. Pack, president, J. E. Davidson, chairman, Commercial National Section, and Paul S. Clapp, managing director, respectively, of the N.E.L.A.; Gerard Swope, president, and A. E. Waller, managing director, respectively, National Electrical Manufacturers' Association; L. W. Davis, general manager, Association of Electragists, International; and J. E. North, representing the League Council. G. E. Cullinan, chairman of the executive committee, Electrical Supply Jobbers Association, and C. L. Chamblin, president of the Association of Electragists, International, were already directors of the Society.

Congressman to Move to Rescind Arizona's Statehood

Representative Joseph Crail of the Tenth Congressional District ejected a new element into the Colorado River situation when he recently announced that at the next session of Congress he will move for the rescinding of statehood for Arizona and its restoration to the condition of a territory, on the ground that "it has violated, annulled and renounced the Constitution of the United States and its treaty made with the United States when it was admitted to statehood."

In making his announcement Mr. Crail said in part:

"When Arizona was admitted to statehood in 1910, it entered into a solemn treaty with the United States by which, among other things, it agreed:

1. To disclaim all right and title to the unappropriated and ungranted public lands lying within its boundaries.

2. That no taxes should be imposed by the state upon lands or properties therein belonging to the United States or reserved for its use.

3. To reserve to the United States with full acquiescence of the state all rights and powers for the carrying out of the provisions of the Reclamation Act for the construction of irrigation works and for the reclamation of arid land to the same extent as if Arizona had remained a territory.

4. That these provisions should be made a part of the state constitution in such terms as should positively preclude the making by any future constitutional amendment of any change or abrogation thereof in whole or in part without the consent of Congress.

After pointing out that these provisions were duly made a part of the state constitution of Arizona without any dissent or objection, Mr. Crail continued:

Among the public lands reserved to the United States under this treaty was the bed of the Colorado River and a strip of land a mile wide on either bank of the river, throughout the full course of the river through Arizona, and all dam sites where water could be impounded and all power sites where hydroelectric energy could be generated on the Colorado River in the state of Arizona.

For years Arizona has been blocking the construction of a high dam at Boulder Canyon on the claim that the Colorado River belongs to the state of Arizona and that the dam could not be built by the government until the federal government or the people of southern California would pay to the state of Arizona taxes on the government land and government-built hydroelectric generating plant in the sum of $6,000,000 or $7,000,000 per year forever.

Mr. Crail contended that by voting at a special election on May 31, 1927, to amend the constitution of Arizona so as to eliminate provisions 1 and 2 quoted above, (Electrical West, July 1, p. 50) it had abrogated "the solemn obligations which Arizona had assumed toward the federal government by which it had been admitted to statehood," and that he was going to tell these facts to the people of the United States and to ask Congress to repeal the enabling act by which Arizona became a state, an act which Arizona itself had repudiated.

Governor Hunt in commenting on Mr. Crail's speech said, according to press dispatches from Phoenix: "Any congressman can say what he wants to say and can introduce any resolution or bill he desires in Congress but when a congressman indulges in such talk as Mr. Crail's reported address he makes himself appear silly. Mr. Crail also could introduce a resolution or bill providing that the country permit no kind of pigs except blue pigs."

Exceptionally Fine Program Planned for A.I.E.E. Convention Sept. 13-16

Hotel Del Monte, Del Monte, Calif., an ideal site for any convention.

A week of profitable and pleasurable activity is in store for the delegates and guests who will attend the annual Pacific Coast convention of the American Institute of Electrical Engineers at Del Monte, Calif., Sept. 13-16. This is one of the three annual national conventions of the Institute.

Under the direction of P. M. Downing, vice-president in charge of electrical construction and operation, Pacific Gas and Electric Company, and regional vice-president of the A.I.E.E., the definite aim of all of the committees is to present a program of exceptionally high character. Reference to the accompanying program will give something of an indication of the high quality of the papers that are to be presented. Also it may be noted that the total number of papers to be presented has been kept down to a minimum consistent with the amount of time available for the convention in order to provide a suitable amount of time for discussion. On several previous occasions so many papers have been presented that time for discussion in many cases did not materialize at all.

An interesting feature of this program is the fact that the first day will be given over to a convention of delegates from the various student branches. To these sessions all attending delegates are invited. The student conference will open Tuesday noon, Sept. 13, and will be in charge of R. W. Sorensen, professor of electrical engineering at the California Institute of Technology, Pasadena. The opening meeting will be a luncheon, and this will be followed by a conference of student counselors of the various branches. Subsequent to that will come the general session of the student convention

when several brief papers on important subjects that have been prepared by the students will be presented.

In addition to the excellence of the technical program to be presented at the convention, there will be numerous entertainment features and sporting events. Probably the outstanding sporting event will be the annual golf tournament with the J. B. Fisken cup as the prize. Other sports include swimming, tennis and boating. Special entertainment features will be provided for women guests and will include bridge parties, motor trips, golf, swimming, tennis, and similar activities. In order to make the annual banquet the one large general social affair the committee has decided to hold it at 7 p.m. on Thursday evening. Here again the entertainment committee has provided numerous interesting features.

Without inspection trips for the purpose of enabling visiting delegates to visit important projects of an engineering nature no convention would be complete. Available from Del Monte are the Pit River and Melones projects of the Pacific Gas and Electric Company, the Feather River project of the Great Western Power Company, the Kings River project of the San Joaquin Light & Power Corporation, and the Big Creek development of the Southern California Edison Company, to say nothing of the offerings of the San Francisco Bay region. Inspection trips will be arranged to suit parties wishing to make any visit or visits, and details may be arranged with the entertainment committee at the convention. One trip in particular that will be of more than usual interest will be the visit to the Ryan high-tension laboratory at Stanford University where Dr. Harris J. Ryan himself will be the host.

By special arrangement with the Del Monte Hotel, the following rates will be in force for the convention:

Single room, without bath, 1 person, $8.00.
Double room, without bath, 2 persons, $7.50 each.
Single room with bath, 1 person, $10.00.
Double room with bath, 2 persons, $9.00 each.
Two single rooms, bath between, 2 persons, $9.50 each.
Two double rooms, bath between, 4 persons, $8.50 each.

Details of the program as tentatively planned follow:

Tuesday, Sept. 13
Registration

12.00 m. Student Branch Counselors' and leaders' luncheon.
2.00 p.m. Student Branch conference.
3.00 p.m. Student technical meeting.
Evening—open.

Wednesday, Sept. 14
Technical Session

9.30 a.m. Reukema—Relation between Frequency and Spark-over Voltage in a Sphere-Gap Voltmeter.
Carroll and Lusignan—The Space Charge that Surrounds a Conductor in Corona.
Satoh—Electric Oscillations in the Double-Circuit Three-phase Transmission Line.
Afternoon—recreation.
8.00 p.m. General Meeting.
Address by President Gherardi.
Address by Dr. Ryan on Phases of Future Electrical Development.

Thursday, Sept. 15.
Technical Session

9:30 a.m. Chamberlin—Advance Planning and Practices in Long Distance Communication.
Jacobsen and Wheelock—Tandem System of Handling Toll Calls in and about Los Angeles.
Belt—Coupling Capacitors for Carrier-Current Communication over Power Lines.
FitzGerald — Carrier-Current Relay Protection.
1:30 p.m. Wood, Hunt and Griscom—Transients due to Short Circuits. Study of tests made on Southern California Edison 220-kv. system.
Jollyman—Equipment for 220-kv. systems.
Evans and Wagner—Application of Intermediate Synchronous Condenser Stations to Long-Distance Transmission Lines.
Alger—Synchronous Condensers.
7.00 p.m. Banquet.

Friday, Sept. 16
Technical Session

9:30 a.m. Legg—Oscillographic Recording Apparatus for Transmission Line Studies.
Wilkins and Crellin—High-Voltage Oil Circuit Breakers for Transmission Networks.
Sorensen, Hamilton and Hayward —Lightning Protection for Oil-Storage Tanks and Reservoirs.
Schaeffer—Lightning Protection for Oil Tanks.
Friday afternoon and Saturday—open for recreation and trips.

Pacific Coast Electrical Association

New P.C.E.A. President Has had Long Electrical Career

W. L. Frost, the newly elected president of the Pacific Coast Electrical Association, has had an interesting career in the electrical industry.

W. L. FROST

Twenty-seven years ago he began as a meter reader in the Pasadena district of the Edison Electric Company, which later became the Southern California Edison Company. He spent three years in that district and during that time acquired the rating of first class lineman. His ability as a commercial man early asserted itself, and in 1903 he was placed in the commercial department at the general office as general utility man. In 1905 he was sent to the Santa Ana district as chief clerk, and a year later he was returned to the Los Angeles office as assistant purchasing agent. The following year he went to the newly created Redondo Beach district where he remained three years as district manager, leaving there to become district manager at Santa Ana, an office that he held for two years. Then followed seven years as district manager at Redlands whence he was transferred to the general office of the company as assistant general agent under S. M. Kennedy, a position that he held until Mr. Kennedy's retirement when he was made general commercial manager for the company, the office that he now fills.

Throughout his entire career, Mr. Frost has been very prominent in Pacific Coast Electrical Association activities, and has been a director since

One of the sections to which much credit was given for its work during the 1926-27 association year was the Purchasing and Stores Section. In this photograph, taken at the section's last meeting for the year, are (back row, left to right)—G. H. Grummett, San Joaquin Light & Power Corporation; C. A. Kelley, The Southern Sierras Power Company; W. J. McCullough, Southern California Edison Company; R. E. Thompson, William deWaard and S. R. Robinson, respectively, of the San Diego Consolidated Gas & Electric Company. (Front row)—G. N. Riblett, F. A. Westrick, W. F. Raber, and C. D. Weiss, chairman, all of the San Diego Consolidated Gas & Electric Company, and H. O. McKee, Southern California Edison Company.

1922. He also has been a vice-president of the California Electrical Bureau for the same period. For the past two years he has been a member of the executive committee of the Commercial Section of the National Electric Light Association and was re-elected for the ensuing year.

Women's Committee Entertain at "Electrical Luncheon"

What would be considered a "strictly electrical" luncheon meeting was held recently by the Women's Committee of the San Joaquin Light & Power Corporation and the Valley Electrical Supply Company, Fresno. Mrs. Nira Letchworth, chairman of the committee, presided.

The luncheon, at which the wives of employees were the guests, was held in the Power Building Auditorium and was cooked entirely on electrical appliances by women employees of the two companies. A. G. Wishon, president of the San Joaquin company, welcomed the guests, who numbered about one hundred. J. U. Berry, advertising manager, Valley Electrical Supply Company, gave an informative talk on the care and use of electrical appliances and Al Joy, director of publicity for the San Joaquin company, spoke on "Electricity in the Emancipation of the Human Race." Solos and musical numbers were rendered by employees of the two companies.

Engineering Section's Fall Conclave Announced.—The fall conclave of the Engineering Section, P.C.E.A., will be held in Los Angeles Aug. 30-Sept. 2. Meetings will be held in the Los Angeles Gas & Electric Corporation Building, 810 South Flower Street, according to tentative plans. Activities of the section this year are under the direction of C. F. Gilcrest, superintendent of the meter department, San Joaquin Light & Power Corporation, Fresno, who is chairman of the section.

First Prize in Essay Contest Won by Oakland Man

The first prize in the essay contest conducted by the customer relations committee of the Commercial Section, P.C.E.A., under the chairmanship of W. P. Graef of the Southern California Edison Company, just prior to the annual convention, was won by E. L. Priest of the Pacific Gas and Electric Company, Oakland, Calif. The subject was, "How Can I Best Serve My Company and Its Customers?" The second prize was won by Frank M. Allen, The Southern Sierras Power Company, Rush Creek Plant, and the third prize by Dewitt Scott of the San Joaquin Light & Power Corporation, Fresno. Twenty-eight prizes in all were awarded.

The customer relations committee was composed of the following members in addition to the chairman: J. W. Wrenn, Great Western Power Company; H. H. Ranlett, Los Angeles Gas and Electric Corporation; Albert Cage, The Southern Sierras Power Company; Lloyd Henley, San Joaquin Light & Power Corporation; Alfred May, San Diego Consolidated Gas & Electric Company; and George M. Rankin, California Electrical Bureau.

E. L. PRIEST

Northwest Electric Light & Power Association

New President Long Active in Association Affairs

A. C. McMicken, general sales manager, Portland Electric Power Company, Portland, was elected president of the Northwest Electric Light & Power Association for the year 1927-28, at the Salt Lake convention. He has been active in association affairs for many years, having acted on Commercial Section committees as member or chairman and during one administration as section chairman. In 1924-25 he was chairman of the electric range and water heater committee of the Commercial National Section, N.E.L.A.

Mr. McMicken was born in Fillmore, Utah, in 1885. When he was five years old his family moved to Portland where he received his early schooling until at seventeen it became necessary for him to leave school and go to work. After employment for a few months in a brickyard, he made his debut in September, 1902, into the electrical industry as delivery boy in the supply department of the General Electric Company, Portland. In 1906 he was made motor salesman in the same company, working under R. M. Townsend, who was then contract agent and is now property and tax agent for the Portland Electric Power Company. In 1907, on the formation of the Portland Railway, Light & Power Company, now the Portland Electric Power Company, when Mr. Townsend was transferred to the property department, Mr. McMicken was made contract agent, a position he held until 1911 when he was promoted to be sales manager of the Portland division. In July, 1926, his jurisdiction was extended to all divisions of the company, and certain operating responsibilities were added to the position so that his title was changed to general sales manager.

A. C. McMICKEN

Administrative Personnel for 1927-28 Completed

With the acceptance of section chairmanship appointments at a meeting of the executive committee at Portland, July 7, the administrative personnel of the Northwest Electric Light & Power Assocation was completed for the year 1927-28. The newly appointed section chairmen are as follows: Accounting—F. W. Brownell, comptroller, Puget Sound Power & Light Company, Seattle; Commercial—J. C. Plankinton, sales manager, Northwestern Electric Company, Portland; Engineering—O. L. LeFever, superintendent, Northwestern Electric Company; and Public Relations—George L. Myers, assistant to the president, Pacific Power & Light Company, Portland.

In keeping with the desire to establish a central and permanent secretarial office for the association, the executive committee accepted the offer of the publishers of Electrical West to use its Northwest office at 1206 Spalding Building, Portland, and the services of Berkeley Snow, its Northwest editor, in this capacity. In addition. W. E. Hudleson, Portland Electric Power Company, was appointed assistant to the president, while A. J. Johnstone, auditor for that company, was appointed treasurer.

Other matters discussed and determined at the meeting were the budget of the coming year, program of work for the sections, and section committee chairmanships and committee personnel.

The completed executive committee is as follows: President—A. C. McMicken, general sales manager, Portland Electric Power Company, Portland; vice-president at large—R. M. Boykin, manager central district, Puget Sound Power & Light Company, Seattle; vice-president for Idaho—R. B.

King, superintendent, Idaho Power Company, Boise; vice-president for Montana—W. B. McDonald, manager, Mountain States Power Company, Kalispell; vice-president for Oregon—Z. E. Merrill, assistant general manager, Mountain States Power Company, Albany; vice-president for Utah—P. M. Parry, commercial manager, Utah Power & Light Company, Salt Lake; vice-president for Washington, Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane; retiring president—D. C. Green, vice-president and general manager, Utah Power & Light Company, Salt Lake; members at large, representing the utilities, J. P. Lottridge, vice-president and general manager, Eastern Oregon Light & Power Company, Baker; representing the manufacturers—A. S. Moody, Northwest manager, General Electric Company, Portland; representing the jobbers—J. I. Colwell, Northwest manager, Graybar Electric Company, Seattle; and the four section chairmen named above.

"His Sisters and His Cousins and His Aunts"?

How'd you like to be the chairman of the Public Relations Section, Northwest Electric Light & Power Association? Here he is surrounded by the members of the Women's Committee in attendance at the recent convention in Salt Lake City:

Back row, from left to right—Mary K. Walsh, The Washington Water Power Company, Spokane; Mrs. A. W. Angell, Northwestern Electric Company, Portland; Marguerite Butler, Women's Committee chairman, Portland Electric Power Company, Portland; Mildred Knight, California Oregon Power Company, Medford; R. M. Boykin, chairman, Public Relations Section, Puget Sound Power & Light Company, Seattle; Mrs. Gertrude McDevitt, Idaho Power Company, Boise; Stella Dorgan, Mountain States Power Company, Albany; Mrs. Nell Laws, Puget Sound Power & Light Company, Seattle.

Front row: Mrs. Evva O. Moyle, Mae Ferrin, Rosella Pratt, all of the Utah Power & Light Company's Salt Lake City office, and Jane Poole, of the same company's Idaho Falls division. Miss Ferrin and Miss Pratt presented the playlet "Before and After" at the Public Relations session of the convention, and Miss Butler and Mrs. Moyle were speakers at the same session.

Books & Bulletins

WATER POWER ENGINEERING

By H. K. Barrows, S.B., member American Society of Civil Engineers and American Institute of Consulting Engineers, professor of hydraulic engineering, Massachusetts Institute of Technology, consulting hydraulic engineer. First edition 1927; 6 x 9 in.; cloth bound; 734 pages; 306 illustrations; 120 tables; 4 appendices. Published by McGraw-Hill Book Company, Inc., New York. Price $6.

This is indeed a complete treatise upon the subject of water-power engineering and obviously has been designed by the author as a text book upon the subject. The scope of the text is quite broad and the subject matter is well handled. The author devotes the first 37 pages to a discussion of the distribution and uses of water-power developments, touching briefly upon water-power developments in all parts of the world. Further to lay a firm foundation for a general understanding of the subject, the author devotes 85 pages in chapter two to a discussion of hydrology and 60 pages in chapter three to a study of stream-flow data and water-power estimates.

After the general foundation laid in the first three chapters the author branches into more detailed studies, covering in succession hydraulic turbines and general arrangement of plants wherein he discusses several existing installations and the theory involved in design and construction. Subjects subsequently treated include a study of dam design and construction, canals and penstocks, power house and equipment, plant accessories, speed and pressure regulation, transmission lines, cost and value of water power, and reports and plant description.

In the first appendix, A, is given an outline of logical procedure in studying hydroelectric development. An example of a report upon a proposed hydro development is presented in appendix B, while typical plant descriptions are gone into somewhat in detail in appendix C. Numerous problems for each of the different chapters in the book are given in appendix D.

A MANUAL OF AUTOMATIC TELEPHONY

By Charles W. Wilman, A.M.I.E.E., chartered electrical engineer, lecturer in telephony at the Coventry Municipal Technical Institute. 5 x 7 in.; cloth bound; 243 pages; 76 illustrations. Published by Crosby Lockwood & Son, London. Price 7s. 6d.

In this book the author deals in an elementary manner with the principles underlying the art of automatic telephony. Apparently it has been designed as a handbook for telephone apprentices and deals with automatic telephone operation from a practical point of view. Examples of the application of generally understood telephone principles to the problems of modern British practice are given.

MANUAL OF ENDURANCE OF METALS UNDER REPEATED STRESS

By H. F. Moore, D.Sc., research professor of engineering material in charge of the investigation of fatigue of metals, University of Illinois. Published by the Engineering Foundation, 29 West 39th street, New York, as publication Number 13. 5 x 7½ in:; cloth bound; 63 pages; 5 illustrations. Price $1.

This little book contains material expressly gathered for the practical use of designing, inspecting, testing and operating engineers and was compiled at the request of the Engineering Foundation. The contents represent much of the usable information resulting from several years of research work on the part of several different investigators. Some of the subjects treated are determination of endurance limit from data of fatigue tests, values of endurance limit for metals, and fatigue failures in service.

A GRAPHIC TABLE COMBINING LOGARITHIMS AND ANTI-LOGARITHMS

By Adrian Lacroix and Charles L. Ragot. 7 x 10 in.; cloth bound; 52 pages; 1926. Published by The McMillan Company, New York. Price $1.40.

To those having use for logarithmic calculations this compilation of graphic tables should be very useful and helpful. Further, the simplification of logarithmic calculations effected and possible by the use of these tables should make feasible the use of such calculations and computations in a much wider field than that in which they are now employed commonly. A five-place table covering 40 pages and combining in one graphic scale all five-place numbers and all five-place logarithms, either of which can be read directly in terms of the other without interpolation is the major feature of the book. The simplicity with which this graphic chart may be read, the elimination of auxiliary tables of proportional parts, and the accuracy of results obtained make this table more convenient, rapid and reliable than ordinary forms of logarithm tables.

BENJAMIN GARVER LAMME ELECTRICAL ENGINEER

An autobiography edited and published through the interest and activity of Mansfield Dudley and others. Published in 1926 by G. P. Putnam's Sons, New York. Price $3.

The major portion of this book is a very interesting narrative prepared by the late Mr. Lamme as a record of his first thirty years of engineering practice. It is a most interesting and illuminating discourse upon the development of electric machinery written by a contemporary who played a very important part in the development of that machinery. The latter portion of the book has been prepared by those interested in rounding out Mr. Lamme's own description of the electrical engineering developments by a biography covering some of the many interesting traits of Mr. Lamme's personal life.

Contractors, Dealers and Inspectors

Laurence Davis Makes Circle of Pacific Coast on Electragist Program

LAURENCE W. DAVIS, general manager of the Association of Electragists, International, carrying the message of a united industry working toward the more complete electrification of American homes and industries through co-operative rather than competitive effort, has just completed a tour of the Pacific Coast addressing large industry groups and contractor associations as well as starting the organization of Electragist groups along the route of his trip.

Beginning at Spokane, Wash., June 28, and circling through Washington, Oregon and California and returning by way of Salt Lake City to the national convention of the A.E.I. in St. Louis, Mr. Davis addressed as many as three meetings a day in order to meet all demands for his message in the limited time available to him during the six weeks tour of the West. To contractor groups he brought the ideals and purposes of the Electragists' organization and pointed out the necessity and value of inter-relation with other branches of the industry for a united selling program. The estimating, trade policy, accounting and other activities of the association he described and offered to contractor groups.

Oregon Organizes Association

As a result of Mr. Davis' visit to Oregon and Washington a number of new Electragist organizations were given birth. In Seattle the two existing associations of contractors affiliated, each retaining its identity but becoming separate sections of the Seattle Electragists. In Tacoma the contractors' association became affiliated with the national organization and changed its name to the Tacoma Association of Electragists.

In Oregon, following a tour including Portland, Hood River, The Dalles, Salem, Albany, Eugene, Roseburg, Grant's Pass and Ashland, contractors affiliated themselves with the Electragist organization and the first state meeting of the newly formed Oregon Electragists will be held in Portland, Aug. 16. Clyde Chamblin, national president, and Cy Geisbush, manager of the California Electragists, on their way home from the St. Louis convention, will attend and take part in that convention program.

Competition Is Between Industries

In the meetings attended by representatives from all branches of the industry, held in all the larger cities on his itinerary, Mr. Davis stressed the fact that the electrical industry as an industry is in competition with other great industries, and that internal bickerings and misunderstandings only serve to weaken its morale in the greater competition of the entire industry for the public's purchases. He pointed out how other industries, forgetting competition between members of their own industry, were setting forth upon great educational and promotional campaigns to win favor for their products. The copper and brass association, he declared, was of its own volition setting about to sell greater home electrification merely because copper and brass is used in all wiring.

As to the merchandising of appliances he said that the Electragists favored central-station merchandising providing it was conducted upon a basis with which contractors could compete. The electrical contractors of the United States, he said, constitute a great unpaid sales force for the industry, but he urged that this sales force be developed by co-operation.

The recent Industry Wiring Conference he characterized as one of the most beneficial controversies in recent times. Out of it, he declared, had come the realization that if anything was retarding the growth of electrical installation in the country it was poor selling effort. The cost of wiring can be reduced (he quoted from the report of that conference) only by improved methods, tools and technique. On the other hand an undeveloped market for the sale of more adequate wiring exists which will provide outlets for energy, appliances and materials far more important than would be the reward from any effort toward the cheapening of wiring installation.

The greatest need of both contractor and jobber groups, Mr. Davis declared frankly, was a better and more open credit relationship between the two branches of the industry. The jobber, in reality a banker in supplies, cannot afford to set up in business or to continue to extend credit to contractors who cannot present accurate accounting records and maintain cost study on their operations, he pointed out.

Other cities visited by Mr. Davis in which contact with contractors and industry groups was made included Wenatchee, Wash.; Victoria and Vancouver, B. C.; San Francisco, Los Angeles, San Diego, Fresno and Visalia, Calif.

Oregon Electragists

The first state-wide meeting of electrical contractors of Oregon fo the purpose of forming a state organization will be held in Portland, Aug. 16. Write J. R. Tomlinson, 51 Union Avenue, Portland, for details.

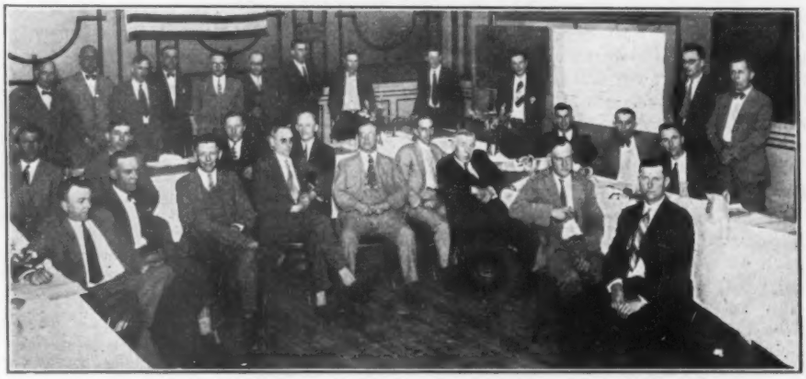
H. C. Huggins has opened a new electrical store at Chula Vista, Calif.

Paul Needham, Electragist of Beverly Hills, Calif., brought in four Red Seal jobs in one week recently.

M. Flatland, Globe Electric Company, San Diego, Calif., was a visitor to the San Francisco Electrical Contractors and Dealers Association in the company of his son, **Lloyd Flatland,** of the **Globe Electrical Works** of San Francisco.

The Rainier Electric Company, Seattle, electrical contractor-dealers, located at 219 Seneca Street for the past seven years, will move to 1109 Third Avenue, where a store 20 x 100 ft. will be occupied. **Julius Hooper** is president.

About to Estimate Electragistically



Meeting in Fresno recently to receive the first Electragist lesson in estimating as presented by C. J. Geisbush, standing at extreme right with H. W. Stitt.

Plan for State Electragist Convention at Riverside

Arrangements are proceeding rapidly for the annual state convention of the California Electragists to be held this year at the Mission Inn, Riverside, Calif., Oct. 14-15. Following a visit to the inn by H. W. Barnes, assistant secretary, in which was taken up with the management the matter of rates and arrangement for meeting rooms, etc., Mr. Barnes made a report that conditions were very favorable for an unusually fine convention in the setting of the famous old hostelry.

While the details of the program have not progressed to a stage at which announcement of them can be made, the details as to hotel reservations are fairly well defined. Rates have been arranged for with the hotel on the American plan and provision made for those who wish to arrive a day earlier or stay a day later to enjoy the same rate as prevails during the convention. This will be especially valuable for those who drive from the Northern Division to Riverside to attend the convention and who may wish to stay over an extra day before starting home.

The schedule of the rates has been announced as follows:

$7.50 per person per day for single room without bath.

$9.50 per person per day for single room with bath.

$13.00 two persons per day for room without bath.

$16.00 two persons per day for room with bath.

The Mission Inn is noted for its excellent food as well as for the exquisite setting of its dining room. Meetings will be held in the attractive and quaint auditorium, filled with relics of early California history. The auditorium is equipped with a stage and has seating accommodations for a large number of people. A pipe organ will help to lend atmosphere to the convention sessions.

Announcement as to the convention committees and possibly of preliminary details of the program are expected to be forthcoming in time for publication in these columns in the next issue of Electrical West.

E. C. Headrick, of Denver, Colo., has been re-elected executive committeeman and chairman of the radio committee, Association of Electragists, International. Mr. Headrick gave an interesting resume of the recent Electragists' convention at a meeting of the Electrical League of Colorado a short time ago.

The Sturgeon Electric Company of Denver, Colo., has secured the electrical contract for the new Infirmary Building of the J. C. R. S. on the Golden Road.

Guscott-Merrill, electrical contractor-dealers for several years located at 1636 Sawtelle Boulevard, have moved into new quarters at 11314 Santa Monica Boulevard, Sawtelle, Calif.

New Officers Elected for Denver Association.—At the annual meeting of the Denver Electrical Contractors Association held at its headquarters in the Coronado Building recently, **C. N. Shannon of C. N. Shannon Company**, Denver, was named president to succeed **P. Harry Byrne** of the **Byrne Electric Company. W. R. Kaffer** of the **Kaffer-Chapman Electric Company** was named vice-president and **E. C. Headrick** of the **Headrick Electric & Radio Company** remained secretary-treasurer. The board of directors consists of **P. Harry Byrne, W. A. J. Guscott, E. C. Headrick, W. R. Kaffer** and **C. N. Shannon.**

Moves Into New Quarters

L. G. Jeffery is proud of the new sign on the window of his new shop in Fresno.

L. G. Jeffery, proprietor of the **Electric Construction Company**, electrical contractors of Fresno, Calif., recently moved to new and larger quarters at 1228 H Street. The new quarters give Mr. Jeffery much more space for storage of materials and allow for the driving of trucks through an alley entrance directly into the shop of the store. Mr. Jeffery says that he finds this quite an advantage in the handling of material for the new Roosevelt School in Fresno, the electrical work for which this company is doing.

The Watts Electric Company, Jack Watts, owner-manager, for the past seven years located at 108 Cherry Street, Seattle, has removed to 608 Second Avenue. The company specializes in electrical contracting but in the new location will add a complete line of appliances, fixtures, etc., also hardware, paints and fishing tackle.

Charles Hill, for the last year managing the **Van Nuys Electric Company** of Van Nuys, Calif., recently opened a second store at Owensmouth. An aggressive campaign of merchandising and electrical contracting is being carried on under his management.

R. Honegger, president of the **Capital City Electric Company** of Des Moines, Iowa, was a visitor recently in San Francisco. He called upon **Clyde Chamblin**, president of the Electragists, International. Mr. Honegger is a prominent Electragist in his home city.

Estimators' Section Publishes Monthly House Organ

Following its achievement in the creation of a suggested specification form for architects and builders the Estimators' Section of the California Electragists, Southern Division, blossomed forth recently with a six-page house organ entitled The Estimator. The Estimator is printed by means of a mimeograph machine and is attractively prepared with printed heading on the cover and an enlarged drawing of the Estimators' Section emblem on the first sheet.

In bringing forth this new publication the editorial committee states that it is its desire that it may prove of interest to all electrical estimators. It is the intention of the committee to get each issue into the hands of members of that section at the first meeting of each month. A request is made of the members for literary contributions and constructive criticisms.

The editorial committee consists of J. R. Wilson, chairman; H. LaPrade, H. K. Burdick, W. L. Robar, G. R. Dehn, T. H. Few, H. W. Barnes and C. J. Geisbush.

Pomona Gets New Electrical Ordinance.—A new electrical ordinance for the City of Pomona, Calif., was passed recently and has been meeting the full approval of all contractors in this field. Following the passage of the new ordinance, meetings were held between the Pomona Electragists' members, the electrical inspector and other electrical men of the city for the purpose of arriving at a common understanding of specific sections of the ordinance and getting uniform interpretation. The new ordinance is said to have set up better working conditions and is living up to the expectations of those who supported it. The new standards set up are more difficult for the inexperienced or novice to meet, and it is felt that this condition will improve the situation as respects the local, established electrical men.

E. E. Holding, who opened the first electrical store in Utah in 1887 and who has continued to operate as a contractor-dealer ever since, died recently at his home in Salt Lake City. During recent years **G. J. Geuiver** was associated with him in business. His loss is felt to be one of long continued fellowship over many years by his numerous friends in the electrical industry in Utah.

Weathers Sales Company has just been opened at Eighth and F Streets, San Diego, Calif., by **E. W. Weathers** who conducted an electrical motor specialty shop at that location previous to his temporary retirement two years ago. Mr. Weathers is well known in the industrial field, having specialized in motor and industrial work for five years, and will again take up the same class of work.

Personals

C. J. Geisbush, for the past several years executive secretary of the California Electragists, Southern Division, has been made manager of the California Electragists with headquarters in Los Angeles. "Cy" Geisbush needs no introduction to the electrical fraternity of California, for he is well known throughout the state for his

C. J. GEISBUSH

good work among the contractors and dealers.

Born in Milwaukee, Wis., and educated in the schools of that state, Mr. Geisbush began his career in the electrical industry by entering the employ of the Western Electric Company as apprentice at its Hawthorne works in 1910. Following that, his experiences included employment with various electrical firms, in power houses and steel mills that gave him a wide practical knowledge. During the World War he served in the Navy as an electrician, and while in the service attended the electrical school at Hampton Roads, Va. After leaving the Navy he spent a short time in Phoenix, Ariz., and then in 1920 went to California. After a short period of substation installation work and employment as a substation operator, he was elected business agent of Electricians' Union, Local 83, a post he held for eighteen months.

In September, 1923, he was made manager of the Electrical Safety Exchange at San Pedro. He guided that body so successfully through its organization period and the results were so marked that he was asked to reorganize the Southern California Contractors and Dealers Association. That also was accomplished successfully and the next step was the consolidation of the Electrical Safety Exchange with the Los Angeles Contractors and Dealers Association. Shortly thereafter that body, together with the contractor-dealer associations of communities adjacent to Los Angeles, such as San Diego and Santa Barbara, became affiliated with the state organization, which later became the California Electragists. Thus was formed the Southern Division of the California Electragists, of which Mr. Geisbush was made executive secretary.

G. M. Simonson has announced the opening of offices at 406 New Call Building, 74 New Montgomery Street, San Francisco, to render consulting, electrical and mechanical engineering services. Mr. Simonson for the last three years has been a practicing consulting engineer in San Francisco and was for eleven years chief electrical engineer of the state department of public works in Sacramento.

Jacob Maier, Sr., Redlands, Calif, who, for some time past has held the record of being in the service of the Southern California Edison Company for a longer period than any other employee, recently was retired. He had been with the company more than thirty-five years.

William Darden, formerly Pacific Coast manager, Prest-O-Lite Company, with headquarters in San Francisco, has been made district sales manager of E. T. Cunningham, Inc., of that city.

Frank D. Fagan, of the merchandising department of the General Electric Company, Bridgeport, Conn., has been elected vice-president of the Union Electric Company, Pittsburgh. Mr. Fagan had been associated with the General Electric Company for about twenty years and for several years acted as special representative of the International General Electric Company in Japan. He is a native of California.

E. S. Williams, for the past four years superintendent of overhead construction for the Pacific Power & Light Company at Walla Walla, Wash., has been transferred to the Walla Walla River plant near Milton, Ore., as chief engineer in charge of that plant. He relieves **E. E. Berg** who has been transferred to The Dalles, Ore., as asssistant superintendent of power for The Dalles-Hood River system of the company. **Clarence Shinn**, formerly at Pasco-Kennewick, has been transferred to Walla Walla to fill the vacancy left by Mr. Williams.

R. R. Crichton, formerly superintendent of distribution of the Casper, Wyo., division of the Mountain States Power Company, Tacoma, has been transferred to Albany, Ore., to be assistant superintendent of the Willamette division of that company.

A. L. Pollard, since December, 1923, assistant chief engineer, El Paso Electric Company, El Paso, Texas, has been promoted to the position of assistant chief engineer of the Tampa Electric Company, Tampa, Fla.

Dr. William D. Coolidge, assistant director of the research laboratory of the General Electric Company and discoverer of the cathode ray, received the degree of doctor of science from Lehigh University at its recent annual commencement ceremonies.

Darwin G. Tyree, for the past three years secretary of The California Oregon Power Company, Medford, Ore., has given up that position to become manager of that company's newly created investment department.

Mr. Tyree was born in Kentucky in 1896. He attended public and high school at Washington, D. C., and spent one year at Georgetown University law school. In 1915 he left school to go to Phoenix, Ariz., as assistant district counsel in the United States Reclamation Service. In 1916 he was transferred to Los Angeles as assistant district counsel in the same service. There

DARWIN G. TYREE

he attended the University of Southern California law school for two years, leaving to join the United States Army, in which he served for one and a half years in the motor transport corps. After the war Mr. Tyree was re-appointed district counsel with headquarters at Portland, Ore., and was admitted to the bar in 1920. Shortly after he resigned as district counsel to accept a position with The California Oregon Power Company as assistant to the general manager. He was appointed secretary of that company in May, 1924.

While secretary of the company Mr. Tyree conducted several successful preferred stock campaigns, an experience which will be valuable to him in connection with his new work.

Percy H. Whiting, formerly general retail sales manager of Henry L. Doherty & Company, New York, and prior to that manager of the customer ownership division of that company, has resigned to form P. H. Whiting & Company, Inc., which will conduct a general securities business at 1 Wall Street, New York. Mr. Whiting has been a member of the customer ownership committee of the N.E.L.A. since its organization.

J. H. Anderton, vice-president of Thebo, Starr & Anderton, Inc., San Francisco, recently sailed for Yokohama with a party of engineers in connection with development projects in the Orient.

Gerard Swope, president, General Electric Company, recently had conferred upon him the honorary degree of doctor of laws by Colgate University.

J. F. Orr, sales manager, Idaho Power Company, Boise, terminated his affiliation with that company on June 15 to assume the position of manager of the Ogden Division of the Utah Power & Light Company, Salt Lake City. The Ogden Division, which is the second largest division of the Utah Power & Light Company, includes a wide territory surrounding Ogden, Utah, where division headquarters are maintained.

A Missourian by birth and a graduate of Park College, Parkville, Mo., in 1909, Mr. Orr sought his business career in the West, going to Boise in that year and joining the organization of the

J. F. ORR

Idaho-Oregon Light & Power Company, a predecessor of the Idaho Power Company. In 1911 he was appointed local agent of the Idaho-Oregon company at Payette, Ida., and later was made division manager of the Payette Division of the Idaho Power Company. He remained in that position until 1921 when he was promoted to be sales manager of the company with headquarters in Boise. Later the management of the securities department of the company was added to his duties as sales manager.

Mr. Orr has been consistently active in association work, both in the National Electric Light Association and in its Northwest geographic division. In addition to yearly appointment as member or chairman of different committees of the Northwest Electric Light and Power Association, he was in 1924-5 chairman of the Commercial Section of that association, and in 1923 chairman of the N.E.L.A. electric range committee, which commenced the national range survey completed by a subcommittee in 1926.

D. L. Scott, manager public relations, Los Angeles Gas and Electric Corporation, has been made a director of the Advertising Club of Los Angeles.

G. W. Rosekrans, formerly with Guy D. Sissons of Los Angeles, has joined the sales force of C. R. Bach Company, San Francisco.

T. A. Purton, office engineer, Idaho Power Company, Boise, was awarded the second James H. McGraw prize of $150 at the N.E.L.A. convention for his article, "New Business and Leaky Business."

Arthur G. Carpenter, formerly publicity manager, General Electric Company, Los Angeles, has severed his connection with that concern to become associated with Harry H. Culver & Company of that city as salesman in the brokerage department. The firm deals in real estate.

Jose Armero and **Francisco Bustello,** representing large electrical interests in Spain, recently called at the office of the Electrical League of Colorado, Denver, for the purpose of learning something about the organizations' activities and mode of operation. They have been studying electrical development in the United States.

F. H. Mayer, of the engineering department, Southern California Edison Company, Los Angeles, has been spending several months in the general engineering department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, on an exchange with **S. B. Griscom,** a Westinghouse employee who has been spending the same amount of time with the Southern California Edison Company.

E. A. Crellin and **R. W. Wilkins,** assistant engineers in the department of hydroelectric and transmission engineering, Pacific Gas and Electric Company, San Francisco, both were awarded the degree of electrical engineer by Stanford University at its recent commencement ceremonies. The graduate studies pursued by Messrs. Crellin and Wilkins covered a most comprehensive investigation and service tests of oil circuit breakers of various kinds.

J. R. Himmelsbach recently has been placed in charge of the electric refrigeration department of the General Electric Company for the Northwest, with headquarters in Portland.

H. P. Whitten, formerly of Denver, has joined the staff of the Northern States Power Company in charge of its Premier Duplex department, with headquarters in St. Paul, Minn.

E. R. Owen, business manager of the Utah Power & Light Company in Logan, has been elected president of the local Rotary Club.

F. L. Easton, district manager, the Economy Fuse Company, Denver, has been named president of the Businessmen's Art Club of that city.

Obituary

Harley W. Brundige, president of the California Railroad Commission in 1921, 1922, 1925 and 1926 and reappointed to that position at the end of the latter year, died suddenly at Hermosa Beach, Calif., while entertaining a group of friends.

Mr. Bundige first was appointed a member of the California Railroad Commission in 1919, giving up the positions of editor-in-chief and assistant publisher of the Los Angeles Evening Express and of the Morning Tribune to accept the appointment. He had been identified with the newspapers of that city for more than twenty-five years, having arrived there in 1897 to become city editor of the Los Angeles Record. After a short period in Portland as city editor of the Telegram, he returned to Los Angeles to become managing editor of the Evening Express, later becoming editor-in-chief.

In his capacity as private citizen, Mr. Brundige always took an active part in municipal affairs and was instrumental in assisting the city of Los Angeles to accomplish many of its most important civic projects. As president

MARLEY W. BRUNDIGE

of the Railroad Commission he did much to bring about amicable settlements of controversies involving municipalities, public utilities, irrigation and other utility districts. He was born in Kingston, Ohio, in 1865.

Under a new policy of rotating the presidency of the Railroad Commission inaugurated by Mr. Brundige at the beginning of this year so that the increased work and responsibility of that office should be shared by all of the commissioners, **Ezra W. Decoto,** a member of the commission since January, 1925, has been serving as president.

Raymond I. Carruthers, acting district manager at Fullerton, Calif., for the Southern California Edison Company, died at the age of 42 on July 10 after a long illness resulting from an automobile accident which occurred a year ago. He was employed first as a solicitor by the Edison company in 1910 and later held important district office positions successively until 1925 when he was made assistant sales manager of the company. At the time of his death Mr. Carruthers was acting for **Charles B. Hutchinson,** who by a strange coincidence died the day before after a long illness at the age of 53. Mr. Hutchinson entered the employ of the Edison company in 1916 as salesman and held district office positions successively until his death.

E. T. Biven of Biven Bros. Company, Oakland, Calif., died in that city June 6.

Lawrence M. Thomas, president, The R. Thomas & Sons Company, East Liverpool, Ohio, died recently in Mount Dora, Fla.

Meetings

Coming Events

American Institute of Electrical Engineers.—Pacific Coast convention at Hotel Del Monte, Del Monte, Calif., Sept. 13-16.

Association of Electragists, International.—Annual convention at Hotel Chase, St. Louis, Mo., Aug. 8.

California Electragists.—Annual convention at Mission Inn, Riverside, Calif., Oct. 14-15.

Camp Co-operation VII.—Sixth conference of electrical leagues at Association Island, Henderson Harbor, N. Y., Aug. 29-31.

Illuminating Engineering Society.—Annual convention at Edgewater Beach Hotel, Chicago, Oct. 11-14.

Pacific Coast Electrical Association.—Engineering Section: Fall conclave, Los Angeles, Aug. 31-Sept. 2.

Rocky Mountain Division, N.E.L.A.—Coloralo Public Service Association.—Joint annual convention at Colorado Springs, Colo., Oct. 17-20.

Oregon C.R.E.A. Reports on Past Work and Future Plans

The report of George W. Kable, project supervisor, on the work done during the past year with a suggested outline for future activities was the feature of the recent annual meeting of the Oregon Committee on the Relation of Electricity to Agriculture at the Oregon Agricultural College, Corvallis. The meeting was attended by twenty odd members of the committee and interested persons and was presided over by James T. Jardine, director of the O.A.C. Experiment Station, chairman of the committee.

Among outstanding accomplishments during the year, as reported by Mr. Kable, was the completion of the study of fruit dehydration, in which electricity is used to re-circulate warmed air. A complete report of the findings in this investigation are to be published shortly in bulletin form. Another investigation completed, on which a bulletin has just been publisned, is that on the use of electric water heaters for warming the drinking water in poultry houses. Irrigation of garden truck, berries and hops in western Oregon continues to occupy an important place in the committee's major activities, and some interesting data are being collected and reported on from time to time. The production of more and better crops of many kinds by the use of irrigation is being demonstrated continually by these experiments, the report stated.

The program outlined for 1927-28 included activity under the following heads: research, investigation, field studies and demonstrations, publication of reports and bulletins, and miscellaneous publicity. This program recognizes that the work of the committee has progressed sufficiently far to warrant more effort being put on getting the findings of the committee into the hands of farmers who might use them to advantage. Among the means suggested for accomplishing this were publicity in farm papers and the country press, talks to granges and farm organizations, talks over the radio, agricultural fair exhibits, and short courses for power-company rural service men.

Electric Club of Los Angeles Chooses New Officers

Following the recent election held by the Los Angeles Electric Club the official personnel for the ensuing term has been announced as follows: president—Ben G. Wright, Southern California Telephone Company; first vice-president—C. A. Heinze, Bureau of Power and Light; second vice-president—R. G. Kenyon, Southern California Edison Company; third vice-president—L. C. La Mont, Westinghouse Electric & Manufacturing Company; secretary-treasurer—O. L. Moore, Los Angeles Gas & Electric Corporation; sergeant-at-arms—W. A. Knost, Illinois Electric Company.

The executive committee is composed of S. E. Gates, General Electric Company; C. J. Geisbush, California Electragists; R. J. McHugh, Garnett Young & Company; H. H. Ranlett, Los Angeles Gas & Electric Corporation; C. Thorburn, Pacific Electric Railway Company.

Plans Well Under Way for Illuminating Engineering Society's Annual Convention.—Plans for the twenty-first annual convention of the Illuminating Engineering Society to be held at the Edgewater Beach Hotel, Chicago, Oct. 11-14, are well under way. Tentative programs of the formal sessions include papers on vision, light sources, photometry, lighting practice, and natural lighting, with an entire session set aside for central-station lighting men at which the remaining sections of the Lighting Service Manual will be presented.

Electrical Men of California North Bay Counties Meet

The annual meeting of the contractor-dealers and power company men in the North Bay Counties of California was held recently at Agua Caliente. The counties in that district include Marin, Sonoma, Solano, Mendocino and Napa.

The meeting was held under the auspices of the Marin County Electrical Development League and was presided over by L. D. Brundige as chairman. The State of California is divided into twenty-five districts for the purpose of carrying on the Red Seal campaign, and Mr. Brundige is chairman of District No. 7 which is composed of the North Bay counties of the state. Electrical dealers in that district now are planning active promotion of the Red Seal Plan.

Among those who spoke at the meeting were R. E. Fisher, vice-president in charge of public relations and sales, Pacific Gas and Electric Company, San Francisco, whose subject was, "What the Future in the Electrical Industry Holds for the Contractor-Dealer;" and J. A. McWilliams, of the California Electrical Bureau, who spoke on "The Practical Application of the Red Seal Plan in the Contracting Business."

Electrical Leagues to Hold Sixth Conference Aug. 29-31

The sixth conference of electrical leagues will be held at Association Island, Henderson Harbor, N. Y., Aug. 29-31, inclusive.

A special committee is being selected to prepare the business program, which will cover all phases of league operations and will include reports of accomplishments and plans for intensifying local market development work. During the conference there will be held meetings of the League Council and the special committees appointed to advise on the operation of the Red Seal Plan.

Requests for further information about Camp Co-operation VII should be addressed to The Society for Electrical Development, Inc., Suite 600, 420 Lexington Avenue, New York.

"When Good Fellows Get Together"

Apparently the members of the electrical industry of Salt Lake City had a good time when they foregathered recently for their sixth annual convention under the sponsorship of the Electrical League of Utah.

Manufacturer & Distributor

Firm of Sterling & Harkness Joins Allied Industries

Allied Industries, Inc., San Francisco, through its president, **W. S. Greenfield,** has announced a consolidation of the sales organization of **Sterling & Harkness** with the Allied Industries' staff.

The personnel added by this change includes **H. L. Harkness,** who started his career in the electrical industry with Hughson & Merton, manufacturers' agents, in 1907, and remained with them until 1921 when the firm of Sterling & Harkness was formed; **Howard S. Engle,** who entered the electrical industry about twenty-five years ago in the employ of Dunham, Carrigan & Hayden, remaining there until he became associated with Sterling & Harkness upon the formation of that company; and **David M. Hughes,** a graduate of the Massachusetts Institute of Technology, whose experience covers a year spent in the Electrical Testing Laboratories, New York, four years with the Westinghouse Lamp Company in various engineering capacities, two years in the navy and naval aviation during the war, and three years with Sterling & Harkness in Los Angeles.

The Lincoln Electric Company, Cleveland, has appointed the **Wade Engineering Company,** 1855 Industrial Street, Los Angeles, as distributor of Lincoln products in Cauifornia. **Henry N. Wade,** president of the company, is in charge of the Los Angeles office. The company has a branch at 69 Webster Street, Oakland, which is under the direction of **H. T. Lintott.**

The Thomas Machinery Company, 622 American Bank Building, Los Angeles, has announced that John H. Suter, for the past twelve years chief engineer of the Western Machinery Company of that city, has resigned his position to take an active part with **W. P. Hart** in the management of the Thomas Machinery Company, which is owned jointly by Messrs. Hart & Suter.

Griscom-Russell Company, 285 Madison Avenue, New York City, has appointed **C. F. Henderson,** Call Building, San Francisco, as its district representative in central and northern California.

Strait & Richards, Inc., Newark, N. J., has announced that it is now in position to ship from stock electric Glologs for any wattage over 2,000 up to 5,000 at no additional cost except $5 list, which takes care of the two-heat switch.

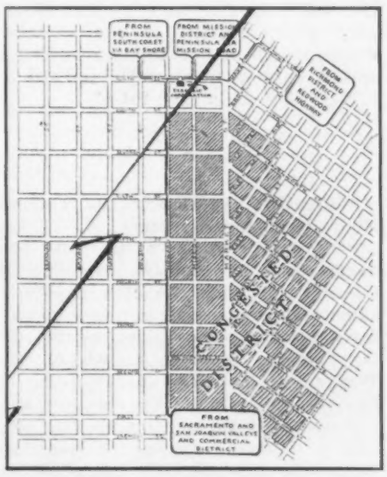
W. C. Bryant, who founded the **Bryant Electric Company,** Bridgeport, Conn., in 1888, and who has been executive officer in charge since that date, has resigned as president and has been elected chairman of the board of directors. **Walter Cary,** first vice-president of the **Westinghouse Lamp Company,** has been elected president in direcent charge of the operation of the Bryant company's business.

The Meadows Manufacturing Company, Bloomington, Ill., has appointed the **Modern Appliance Company,** 69 Webster Street, Oakland, its distributor for central and northern California. The principals of the latter company are **C. B. Angenete, A. V. Scheppelman** and **L. E. Morgan.**

R. D. Thomas, former resident engineer for **Curtis Lighting, Inc.,** Denver, has been made manager for the **Electrical Products Corporation** factory recently established at 680 South Broadway in that city.

The Westinghouse Lamp Company has removed its San Francisco office from 701 Crocker First National Bank Building to 1414 Hunter Dulin Building.

Making It Easy for Customers


FROM PENINSULA SOUTH COAST via BAY SHORE
FROM MISSION DISTRICT AND PENINSULA via MISSION ROAD
FROM SACRAMENTO VALLEY AND INTERIOR
CONGESTED DISTRICT
FROM SACRAMENTO AND SAN JOAQUIN VALLEYS AND COMMERCIAL DISTRICT

The Electric Corporation, 145 Ninth Street, San Francisco, had this map printed in the center of its letterhead and then Grover Andersen, sales manager, wrote this letter on it and sent it to prospective customers: "We are outside of the congested district. Easy to reach quickly. Your pickup man can get his order filled here in five minutes or less. A complete stock of nationally approved electrical supplies and radio. Follow the map and avoid delays in congested traffic. Send your orders here and save time and money."

International Combustion Engineering Corporation, 200 Madison Avenue, New York, has appointed **William B. Senseman** as Pacific Coast district manager for **Combustion Engineering Corporation, Raymond Bros. Impact Pulverizer Company, Ladd Water Tube Boiler Company,** and **Heine Boiler Company,** its subsidiaries. Consolidated offices are maintained in the Subway Terminal Building, Los Angeles.

The Garland-Affolter Engineering Corporation with offices in the Alaska Building, Seattle, has been appointed the representative of the Jeffery-DeWitt Insulator Corporation, Kenova, W. Va., in the Pacific Northwest. The Garland-Affolter Company has represented the Jeffery-DeWitt Company in California for some time.

The B. K. Sweeney Electrical Company of Denver recently has become a distributor for the General Electric refrigerator, serving the states of Colorado, Wyoming and New Mexico. A retail store for the display of these units has been opened at 1422 Court place in that city.

The American Electric Switch Corporation, Minerva, Ohio, is the name of a recently organized corporation which plans to manufacture a large and varied line of safety switches, fuse panels, panelboards, switchboards and distribution panelboards for use in hotels, apartment houses, residences, industrial plants, theaters and the like.

The Appleton Electric Company, 1701 Wellington Avenue, Chicago, has purchased the complete foundry equipment and land formerly owned by **The Stowell Company** of South Milwaukee, Wis., and is operating it under the name of The Wisconsin Appleton Company, Plant No. 2.

The Hatfield Rubber Works, Newark, N. J., has appointed the **James J. Noble Company,** 915 Bryant Street, San Francisco, its Pacific Coast representative.

C. R. Bach Company, 252 Fifth Street, San Francisco, has been appointed Western representative for **Anderson-Pitt Corporation,** Kansas City, Mo., and will handle its line of electric heaters.

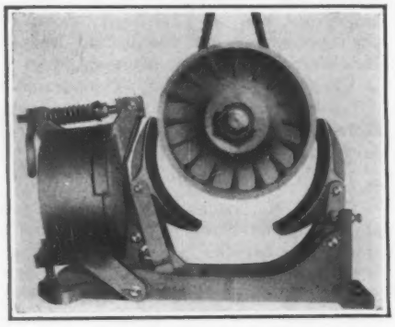
Landers, Frary & Clark, New Britain, Conn., recently moved into its new six-story building in that city. The building was thrown open to the public upon its opening and six thousand people were entertained at the housewarming.

Harry Schockett has established a wholesale lighting equipment business at 1531 Tremont Street, Denver. Mr. Schockett will do no contracting work.

New Equipment

Magnetic Brake

A new **magnetic brake** known as Type WB has been placed on the market by the Electric Controller & Manufacturing Company, Cleveland. In its announcement the company states: This



brake is radically different from any other shoe-brake design in that no levers or rods pass over the top of the brake wheel. The brake shoe arms are caused to operate in opposite directions by means of a simple lever movement having the connecting link within the base below the wheel. This improvement in shoe-brake design will be appreciated by operating departments where time required to change armatures causes costly delays and loss of production. Type WB brakes are a new development to meet the demand for a steel mill type brake of sturdy cast steel construction, which will provide in the highest degree, smoothness of operation in both directions of rotation, exceptionally long life of brake-shoe linings and other wearing parts, ease and accessibility of adjustments, fast operation.

Conduit Fitting

A new type of **conduit fitting,** the SLB entrance fitting, has been placed

on the market by **Killark Electric Manufacturing Company,** 3940 Easton Avenue, St. Louis. The description furnished by the manufacturers states that this fitting is used to make a right-angle bend in service entrance conduit on the outside of a building. As it is exposed to the weather in this usage, it was necessary to make the fitting weatherproof, and accodingly a rubber gasket has been placed between the fitting and the cover. The SLB fitting is made of a special grade of tough gray iron with black japan or galvanized finish. The cover is of cast metal and is held in place by two screws.

Hot Plates

Four new twin **hot plates** of the general utility type have been placed on the market by the **Liberty Gauge & Instrument Company,** Cleveland. All of these hot plates are 8½ in. x 18 in. but two are made of 20-gage steel and two of 20-gage "Armco" iron. No. 401-J, black japanned, has 16-gage steel legs, nickeled; Nichrome IV or Cromel "A" elements mounted in 6-in. special Liberty refractory bases, off-and-on tumbler switches; capacity 110 to 120 volts a.c. or d.c. No. 402-J is of the same general type and is controlled by two 3-heat rotary switches. No. 404-E is finished in blue-black and white vitreous enamel with legs and handles of nickeled steel. It has the same heating elements, the same bases and the same capacity as 401-J, and is controlled by two 3-heat rotary switches.

No. 403-E is the same as No. 404-E, with the exception of the switches which are off-and-on tumbler switches, and it carries 1,000 watts instead of 1,320 watts as in No. 404-E.

Wedge-Nut Fastener.—The Crouse-Hinds Company, Syracuse, N. Y., has announced a new line of Obround condulets that incorporate, according to the company, "many practical and time-saving features, based on a new method for fastening covers and wiring devices to a condulet, known as the **Wedge-Nut fastener.** A few turns of the screw driver and the cover or wiring device is on, and on to stay, and cannot become loosened by vibration. With this new form of construction there are no screws projecting inwardly to injure the conductors. Because of the unobstructed cover opening, conductors may be pulled easily without injury to them, for there are no projecting lugs. The unobstructed cover opening and large wiring chamber make splicing and taping easy."

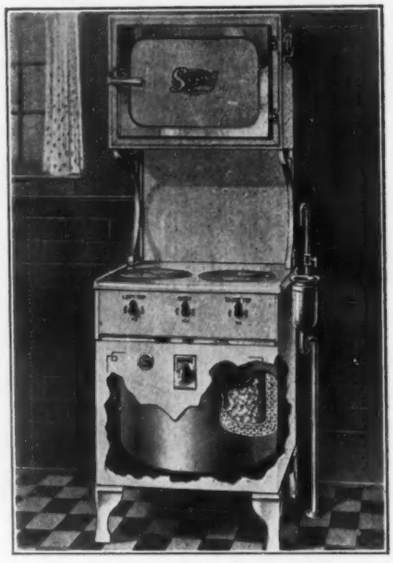
Color Plate

The newest addition to the line of **show window reflectors** manufactured by the **Holophane Glass Company, Inc.,** 342 Madison Avenue, New York, is a

color plate made of natural colored glass and supplied in three colors, amber, green and red. As described by the manufacturer, "the plate is made in the same mold as the control plate of the 200-watt reflector. The color effect obtained by this device is unusually soft. Fading and cracking are entirely eliminated and there is no permanent depreciation either in the color plate or the prismatic reflector itself."

Combination Electric Range and Water Heater

This Sepco **combination range and water heater,** recently added to its line by the **Automatic Electric Heater Company,** 1505 Race Street, Philadelphia, has a total maximum demand at any one time of 2,500 watts and will operate successfully on the regular two-wire, 30-amp. residence line, according to the manufacturer. A temperature indicator is used on the water heater, which is furnished with either 10 or 18-gal. capacity tank, and it is controlled also by a manual double-throw switch which prevents range load overlapping water-heater load. The company manufactures combinations in all sizes from that for the small apartment to those for the largest building and also makes them for three-wire service.



Full Automatic Storage Water Heater

A new storage type **automatic electric water heater** providing a complete assembly in a single unit has been put on the market by the **Hoyt Heater Company,** 4401 E. 10th Street, Oakland, Calif. The new heater is available in 21, 32 and 42-gal. capaci-

ties with either 3 or 5-kw. element. A Kercher thermal switch provides for full automatic control. A double-pole manual switch is supplied also. The heating element extends through the center of the tank and heat radiation is retarded by 2 in. of rock wool. The entire heater is finished in two-tone light gray washable enamel.

Electric Refrigeration Cabinet.—An all-white porcelain enameled Armco iron **cabinet for electric refrigeration** is being put on the market by the **Benjamin Electric Manufacturing Company,** 120 South Sangamon Street, Chicago. This cabinet is called the Crysteel Refrigerator Cabinet, being one of a family of porcelain enameled products made at the Crysteel works of the Benjamin company. The Crysteel cabinet is made in a variety of sizes to meet the requirements of families ranging from three to sixteen persons, and will accommodate practically any make of electric refrigeration unit on the market. One of the features of the Crysteel cabinet is a dome light which illuminates the food compartment and is controlled by a toggle switch.

Recent Publications

Oil Circuit Breakers.—**The Pacific Electric Manufacturing Company,** San Francisco and St. Louis, has prepared Bulletin No. 11 containing a complete description of all of the types of oil circuit breakers and control mechanisms manufactured by that company. The bulletin, which will be ready for distribution early in August, will be a complete catalog in itself, and, according to the manufacturer, should be of considerable interest to engineers interested in transmission equipment.

Industrial Lighting.—A booklet under this title has been issued by the **Holophane Company, Inc.,** 342 Madison Avenue, New York, describing the use and application of "specifics" for various problems in industrial illumination. It is profusely illustrated with photographs of typical installations. This booklet is in addition to the regular commercial edition of the Holophane Datalog, which lists the complete line. It is called Datalog because it combines engineering data with catalog information. Copies may be obtained from the San Francisco office, 74 New Montgomery Street.

Blowers.—A new large size catalog No. 110, featuring the complete line of "Uniblade" motor-driven and pulley-driven type blowers recently has been issued by the **Autovent Fan & Blower Company,** Chicago. The book also contains a comprehensive and instructive discussion on "How to Figure Ventilation." This material deals with calculating air requirements, blower and fan sizes and the sizing of ducts and grills. An important section of the book covers the listing of Autovent propellor-type fans.

Everdur Metal.—The qualities of this metal which is manufactured by **The American Brass Company,** Waterbury, Conn., in the form of plates, sheets, rods, wire, pipe, casting igots, etc., are set forth in a pamphlet, "A Bolt from the Blue." Bolts, nuts, castings, pipe fittings and the like made of Everdur Metal, are manufactured by the **Burndy Engineering Company, Inc.,** 10 East 43d Street, New York.

Automatic Switching Equipment.—Two leaflets recently have been issued by the **General Electric Company,** Schenectady, N. Y., one on automatic switching for synchronous motor-generators in lighting service and the other for outdoor a.c. reclosing feeder service 440 to 73,000 volts.

"They Say This About Electro-Kold."—This is the title of a pamphlet recently issued by the **Electro-Kold Corporation,** Spokane, Wash., setting forth the testimonials of some of its satisfied users.

"Modern Manufacturing with the 'Stable-Arc' Welder."—This is the title of a 36-page booklet recently issued by the **Lincoln Electric Company,** Cleveland, outlining briefly the theory of the use of arc welding in production manufacturing. The first part of the book is given over to the replacing of iron castings by standard rolled steel sections joined by arc welding. There are suggestions for redesigning cast parts for arc-welded steel construction and data on arc welding costs. One section of the book discusses arc welding in the tool room. The book contains numerous illustrations of arc welding processes and several types of "stable-arc" welding machines are illustrated and described.

Seamless Steel Products.—This booklet published by the **Seamless Steel Equipment Corporation,** 26 Broadway, New York, contains numerous illustrations of typical applications of seamless steel products for high pressure and temperature requirements. Several pages are given over to tables of data on seamless pressed and drawn high-prssure containers, rectangular tubing, square tubing and half round superheater tubes.

Electric Ranges.—Catalog No. 15-B is the newest catalog issued by the **Standard Electric Stove Company,** Richardson Building, Toledo, Ohio. Detailed specifications of all models of electric ranges manufactured by this company are given, including many wall and shelf-type models, in addition to heavy-duty ovens, toasters, broilers, griddles, hot plates, plate warmers, fireless cookers, serving tables and water heaters.

Wagner Motors.—**The Wagner Electric Corporation,** St. Louis, recently has published two bulletins, No. 149 describing the single-phase 1/6, ¼ and ⅓ hp. repulsion induction type "66" motor, and bulletin 150 setting forth the advantages of the repulsion induction single-phase type "76" motor in ½, ¾ and 1 hp. sizes.

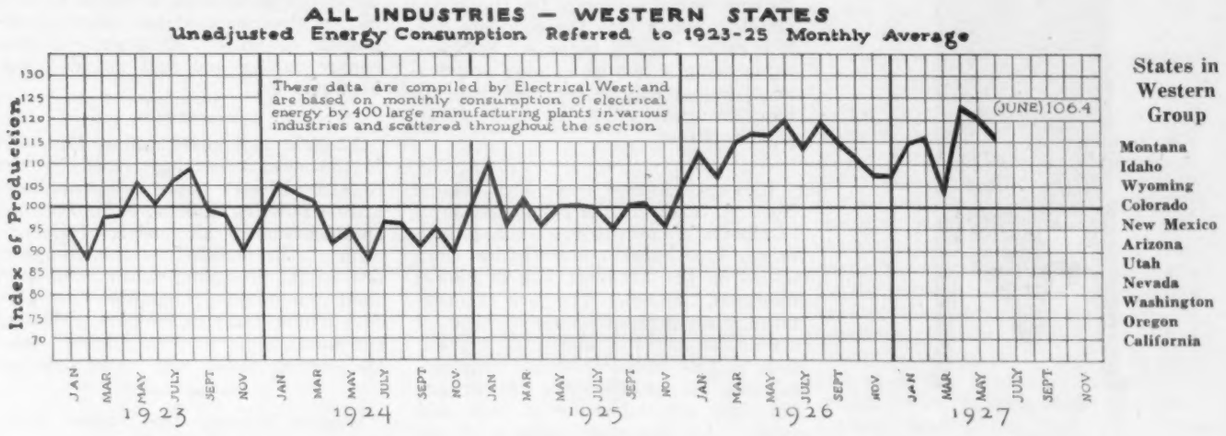
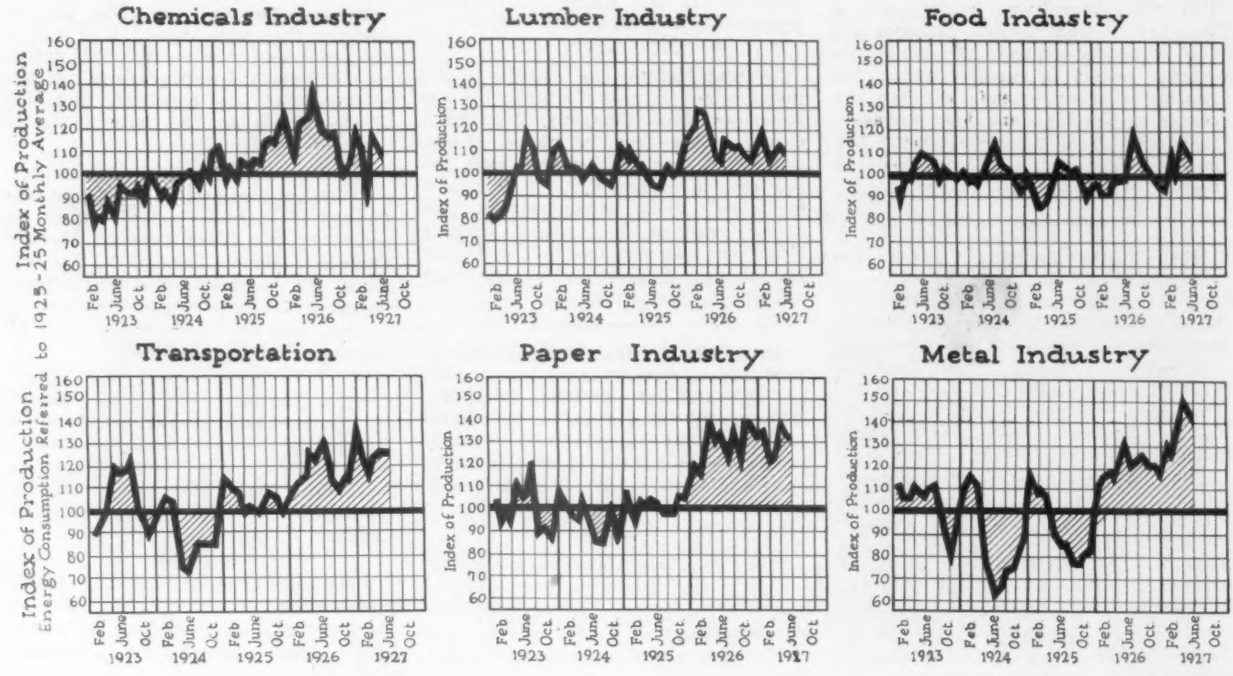
"Vitrohm Dimmers for the Accurate Control of Lighting."—Bulletin No. 68 issued by the **Ward Leonard Electric Company,** Mount Vernon, N. Y., sets forth the advantages, specifications, mounting arrangements and features of control, together with a long list of representative installations.

"Eye Comfort."—This folder issued by **Curtis Lighting Inc.,** 1119 West Jackson Boulevard, Chicago, contains three leaflets entitled "Spectacular Effect for Show Windows," "Curtis Luminaire No. 5000" and "Church Lighting."

Fuse Blocks, Knife Switches, Flush Range Switches.—This is the self-explanatory title of Catalog No. 41 issued by the **Frank Adam Electric Company,** St. Louis.

"Electrical West" Barometer of Industrial Activity in Western States

ELECTRICAL WEST presents herewith a barometer on the productive operations of the manufacturing plants in the Western states. This barometer is based upon the electrical energy consumption of about 400 large manufacturing plants distributed throughout the section and in various industries, these manufacturing plants consuming approximately five hundred million kilowatt-hours of electrical energy per annum. The monthly electrical energy consumption of these plants has been compared with the monthly average consumption for the 36-month period 1923-1925 to obtain an index of productivity in each of the six primary industries of the section. These indexes in turn have been weighted in accordance with the importance of the industries to obtain the index of production for industry as a whole. The weights of the various industries are based upon the value of products of the various industries as indicated by the U.S. Census of Manufactures for 1923. No corrections have been made for seasonal variation or industrial growth. The index figures for the same months, therefore, are directly comparable in studying the total production for various months, but must be adjusted for number of working days in the months concerned to arrive at figures on comparative productive activity. In the case of months with the same number of working days the index figures on actual production and productive activity are, of course, the same.

Many of the outstanding primary industries of the Western states continued to operate at a high rate of activity during June as compared with June of last year, although a general downward tendency, seasonable in nature, was noticeable in practically all of the industries of the section. June activity in Western industry as a whole was 5.8 per cent under that of May, after corrections were made for the number of working days in the two months. The actual production of general industry during June was 3.6 per cent under that reported for May and 3.7 per cent under June of last year.

The downward trend in the general production of the manufacturing plants of the Western states, which has been experienced since June of last year, was brought to a conclusion in April. The operations during the first quarter of the year were even below those of the same period last year, thereby reflecting the trend of general production prevalent throughout the nation as a whole. The April upward turn in the Western states is also a reflection of the national condition of industry, April conditions in the Western states and in national industry as a whole being slightly above that of April last year. This higher rate of activity was continued during May. With June, however, came a downward trend which extended throughout all industry.